

Development of Coatings Performance Specifications for Steel Exposed to the Atmosphere

Aluminum Epoxy Mastic and Epoxy/Urethane Systems

by Timothy D. Race and Mark A. Kelly

Provisions of the Clean Air Act Amendments of 1990 will restrict the use of high solvent-content paints beginning in 1996. Procurement reform indicates the use of other than military specifications and emphasizes the use of commercial products and performance specifications. In response to procurement reform and air quality regulations, the U.S. Army Corps of Engineers must replace some of its existing coating specifications.

This study developed two performance-oriented commercial item descriptions (CIDs) describing aluminum epoxy mastic and epoxy primer/polyurethane topcoat systems for use on minimally prepared steel surfaces that will be exposed to atmospheric corrosion. Accelerated corrosion tests were conducted to establish the performance envelope of these generic types of coating systems. Ten products, representative of each coating system, were exposed and evaluated for blistering, rusting, and rust undercutting. Standard Corps of Engineers coating systems were used as experimental controls and to establish the relative performance of the test coatings.

The study recommends that the Corps submit the draft CIDS to General Services Administration for review and authorization. Further, it is recommended that the Corps implement the authorized documents by inclusion in CWGS-09940, Painting: Hydraulic Structures and Appurtenant Works.



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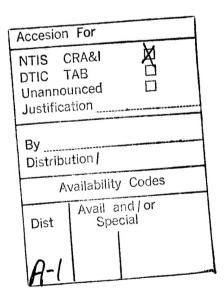
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Foreword

This study was conducted for the Electrical and Mechanical Branch, Engineering Division, Directorate of Civil Works, Headquarters, U.S. Army Corps of Engineers (HQUSACE) under "Civil Works Investigations and Studies"; Work Unit 31205, "Developing High Performance Coatings." The technical monitors were R. Kinsel and J. Gilson, CECW-EE

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1 Introduction

Background

Historic Perspective

Structures operated and maintained by the U.S. Army Corps of Engineers contain millions of square feet of steel.* Protective coatings are used to extend the useful life of the steel and ultimately the structures they comprise. Any of a number of surface preparations and coatings may be used to protect a steel surface depending on the environment and intended use of the painted structure. A steel surface immersed in water, for example, will have distinctly different requirements from one exposed to the atmosphere.

Cost-effective corrosion protection in immersion requires rigorous surface preparation as defined in various specifications. Generally, the level of surface preparation that will be specified under given circumstances is the lowest level that will provide good coating performance. SSPC-SP 5, White Metal Blast Cleaning, or SSPC-SP 10, Near-White Metal Blast Cleaning, are typically specified for surfaces that will be immersed in fresh or salt water. Lesser degrees of surface preparation such as specified in SSPC-SP 2, Hand Tool Cleaning, SSPC-SP 3, Power Tool Cleaning, SSPC-SP 7, Brush-Off Blast Cleaning, or SSPC-SP 6, Commercial Blast Cleaning are usually specified for atmospheric exposures. Historically, the Corps of Engineers has specified SSPC-SP 3 and SSPC-SP 7 for atmospheric painting (CWGS-09940 June 1993; CW-09940 October 1992; CW-09940 August 1989; CW-09940 August 1981; CW-09940 April 1981; CW-09940 November 1979; CW-09940 January 1977; CE-1409 June 1973; and CE-1409 March 1968).

Coatings formulated for use on steel surfaces cleaned in accordance with SSPC-SP 2, SSPC-SP 3, or SSPC-SP 7 are often called "surface-tolerant coatings" (Kapsanis and Appleman 1992). This term derives from the fact that these surface preparation methods may leave traces of surface contaminants such as rust, salts, and old paint. Specific types of surface-tolerant coatings are formulated to provide good protection over these types of contaminated surfaces. Oil-based, long oil alkyd, and modified versions of these coatings containing inhibitive pigments are traditional types of

¹ sq ft = 0.093 m³.

surface-tolerant coatings (Thomas 1989). Red-lead linseed oil primer is a classic example of an oil-based surface-tolerant coating containing an inhibitive pigment.

Historically, the Corps has used coatings such as "TT-P-86 Paint, Red Lead-Based, Ready-Mixed" and "TT-P-615 Primer Coating: Basic Lead Silico Chromate" for priming steel exposed to the atmosphere (CW-09940 [August 1989, August 1981, April 1981, November 1979, January 1977], CE-1409 [June 1973, March 1968]). However, the use of TT-P-615 was discontinued in the August 1989 guide specification revision. The use of TT-P-86 was limited to maintenance painting in 1989 and was also discontinued in 1992. Use of these primers was curtailed because of worker safety and environmental concerns surrounding lead and chromium-pigmented coatings. "SSPC-Paint 25 Red-Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer" was added to the guide specification in 1989. Oil-based, alkyd, and modified versions of these resins are used to topcoat surface-tolerant primers of similar resin chemistries. Traditionally the Corps has used "TT-P-38 Paint, Aluminum, Ready Mixed" and "TT-E-489 Enamel, Alkyd, Gloss," as topcoats for TT-P-86, TT-P-615, and SSPC-Paint 25. TT-P-38 is a tung oil-modified phenolic material pigmented with leafing aluminum. TT-E-489 is used when colors such as black, white, or yellow are required.

Technology Drivers

Most of the research dollars in both the coatings industry and government are spent on developing new coating technologies with reduced levels of organic solvents. Local and state environmental regulations place limits on the volatile organic compound (VOC) content of architectural and industrial maintenance coatings. In response to the Clean Air Act Amendments of 1990, the U.S. Environmental Protection Agency (USEPA) is developing a national rule governing VOCs in architectural and industrial maintenance coatings. The private sector is leading the effort to produce low-VOC technologies, but recently, government paint specifications have generally fallen behind the state-of-the-science and the government has been slow to adopt new paint technologies.

Today the hazards associated with lead and chromium pigments are well known. The Corps response to these hazards has been to eliminate the use of these materials on Corps jobs. SSPC-Paint 25 has replaced lead- and chromium-pigmented paints. Paint 25 is a good coating material, but is based on a relatively old technology. Like the traditional Federal Specification and Corps of Engineers paints, Paint 25 is a "formula specification." Such specifications, which are based primarily on the content of the coating, circumscribe the introduction of new and innovative products.

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Federal procurement reform favors the use of performance-based specifications and commercially available materials. Materials made to conform to Military and other material specifications are rarely sold to the general public; in other words, they are not manufacturers' shelf products.

Rationale for Performance Specifications

The Corps has traditionally used paint specifications that are based on a material's composition, known as "formula specifications." Formula specifications used by the Corps include those prepared by the Corps, Army, Air Force, General Services Administration (GSA), Navy, and the Steel Structure Painting Council (SSPC).* Acquisition reform will largely phase out military specifications prepared by the Army, Navy, and Air Force for use within the Corps by the end of 1995.

Procuring items without specific requirements is risky; unless requirements are properly defined and specified, one may choose a paint that is unsuitable in terms of the quality, performance, or fitness for a given application. The Corps needs an alternative to the traditional formula-based military specifications. Specifications based on a material's performance may provide the required alternative to formula specifications. A public sector procurement system based on performance specifications would offer the dual advantage of promoting competition while providing for a high quality product. However, government procurement documents must specify requirements without favoring individual manufacturers or proprietary products. Requiring the use of specific proprietary products in procurement documents is usually not allowed because it does not promote full and open competition.

GSA is the preparing activity for a number specifications known as Commercial Item Descriptions (CIDs), which may be based solely on performance, but often incorporate some compositional requirements. CIDs are intended for use in procurement documents for a class of commercially available products. SSPC is in the process of developing performance specifications similar to GSA's CIDs. The American Society for Testing and Materials (ASTM)** has some existing standards for coated items that are based on performance of the coated end product.

Accelerated tests are the most practical tool available to quickly assess coating performance. Field exposures and fence tests, while more reliable, take too long to be practical. Accelerated test methods, if used wisely, can reliably predict the relative performance of coatings and can thereby help produce performance specifications for

Steel Structure painting Council, 4516 Henry St., Pittsburgh, PA 15213

^{**} American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19102-1187.

generic classes of coatings such as barrier epoxy coatings, as a practical alternative to formula specifications.

Corps of Engineers Requirements for Paints for Atmospheric Steel

The factors driving technology within the coatings industry as well as current trends in procurement propelled by acquisition reform have combined to form the basis for most of the requirements for paints designed for use on steel exposed to atmospheric corrosion. New specifications adopted for use by the Corps should not be military specifications. Ideally, coatings specified by the Corps will be free of hazardous lead and chromium pigments, will contain low levels of VOCs, and will be based on performance rather than formula specifications.

Objective

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The objective of this research was to develop performance-based material specifications to describe commercially available products that:

- 1. Are suitable for painting atmospheric steel
- 2. Are compatible with current Corps painting practices
- 3. Meet the demands of acquisition reform
- 4. Meet the requirements of air pollution regulations.

Approach

Twenty commercial products representing two generic coating systems were evaluated in accelerated weathering tests. The performance envelope for each generic system was determined, performance requirements were established, and draft performance specifications were developed.

Scope

The results of this study are applicable to Civil Works painting of steel surfaces exposed to atmospheric weathering. The research was not conducted to validate the performance of, or to qualify individual products for use within the Corps of Engineers. The results of the research are intended solely to develop performance-based materials specifications for use by the Corps and other Federal agencies. The results contained herein do not represent an endorsement of any manufacturer or specific product.

Mode of Technology Transfer

The appended draft performance specifications will be submitted to General Services Administration (GSA Center, ATTN: 9FTE-10, Auburn, WA 98001, TEL: 206/931-7929, FAX: 206/931-7544) for review and adoption as CIDs. It is recommended that on implementation by GSA, the CIDs become standard coating systems within the Corps by adoption and reference in CWGS-09940, *Painting: Hydraulic Structures and Appurtenant Works*.

2 Evaluation of Aluminum Epoxy Mastic Coating Systems

Selection of Test Coatings

Epoxy coatings pigmented with aluminum offer an alternative to the use of traditional surface-tolerant coatings (Thomas 1989, Hare 1989, Hare 1990). Ten commercially available aluminum epoxy coatings were selected for evaluation. The selected coatings are manufactured in the United States and have a maximum VOC as applied of 340 grams per liter (g/L). The selected test coatings are compatible with minimally prepared rusted steel substrates. Table 1 lists the 10 aluminum epoxy mastic systems evaluated in this study.

Preparation of Test Specimens

Cold-rolled steel test panels measuring 3.0 x 9.0 in. were initially abrasive blast cleaned to SP-10 to promote the formation of uniform corrosion.* The test panels were then rusted to an initial condition approximating Hand Tool Cleaned (SP-2) steel prepared from steel of condition C of SSPC-Vis 1, by spraying atomized deionized water onto the test panels 10 times a day for 5 days. The test panels were allowed to dry completely prior to rewetting.

The 10 coating systems were applied in accordance with manufacturers' recommended procedures. Where the manufacturer provided an option to apply the coating system in one or two spray applications, two were used. Test panels were scribed prior to exposure in such a manner that the coating was uniformly removed down to the substrate along the entire length of the scribe. The dry film thickness of each coat of each system was measured using a nondestructive magnetic dry film thickness gage. Average dry film thicknesses for each system are listed in Table 1. Dry film thicknesses for individual panels can be found in Appendix A.

¹ in. = 25.4 mm.

Table 1. Aluminum epoxy mastic coating system.

| Manufacturer | Product Name | VOC (g/L) | Dry Film Thickness (0.001 in) |
|------------------------|---|--------------|----------------------------------|
| Davis Industrial Paint | SSPC Paint 25 TT-P-38 (2 coats) | ~290 ~430 | 2.2 1.3 2.1 5.6 (total) |
| Sherwin-Williams | Epoxy Mastic Aluminum II (2 coats) | 173 | 6.8 5.3 12.1 (total) |
| Sherwin-Williams | Surface Tolerant Epoxy Coating (2 coats) | 174 | 6.0 5.5 11.5 (total) |
| Devoe | Bar Rust 239 Aluminum Epoxy Mastic (2 coats) | 86 | 6.2 8.2 14.4 (total) |
| Sigma Coatings | Colturiet TCP Aluminum (2 coats) | 239 | 5.9 6.5 12.4 (total) |
| International | Magna Mastic 7900 (1 coat) | 121 | 5.5 (total) |
| International | Intergard Universal Aluminum (1 coat) | 192 | 7.3 (total) |
| Caboline | Carbomastic 15LO (2 coats) | 88 | 5.0 5.4 10.4 (total) |
| Carboline | Carbomastic 90 (2 coats) | 84 | 5.2 6.0 11.2 (total) |
| Sherwin-Williams | Macropoxy Aluminum (2 coats) | 175 | 6.3 4.1 10.4 (total) |
| Hempel | Hempadur 4515-1987 (2 coats) | 180 | 7.8 8.7 16.5 (total) |

Test Methods

Recent advancements have been made in developing more reliable accelerated test methods. One such method is the use of a cyclic corrosion chamber that incorporates a drying cycle and uses a dilute aqueous salt solution. This cyclic test is described in ASTM G 85, Standard Practice for Modified Salt Spray (Fog) Testing, Annex A5. Dilute Electrolyte Cyclic Fog/Dry Test (1994). This test procedure, coupled with ASTM G 53, Standard Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials (1991), reportedly produces coating failure modes similar to those observed in actual atmos-

pheric weathering and results in improved rank correlations between exterior-exposed and laboratory-exposed test panels (Simpson, Ray, and Skerry 1991).

Six test panels from each system were exposed in a slightly modified version of a G 53/G 85 cyclic test. The concentration of the dilute salt solution was 0.4 percent ammonium sulfate and 0.05 percent sodium chloride. The salt spray temperature was 30 °C and the dry-off temperature was 40 °C. The UV-condensing cabinet was run at 60 °C during the 4h UV cycle (UV-A bulbs) and at 50 °C during the 4h condensation cycle. Samples were exposed for 1 week in the G 53 cabinet followed by 1 week in the G 85 cabinet. Coating system Number 2 from CWGS-09940 was used as an internal control. This system consists of "SSPC-Paint 25" (1st coat) and "TT-P-38, Paint, Aluminum, Ready Mixed" (2d and 3d coats).

The aluminum epoxy coatings were also evaluated for ease of application, mixing properties, sag resistance, leveling properties, film build properties, and ease of cleanup.

Inspection and Evaluation of Test Coupons

The coatings were periodically evaluated for rusting, blistering, and rust undercutting at the scribe in accordance with ASTM D610, SSPC-Vis. 2, ASTM D714, and ASTM D1654. A transparent grid overlay was used to enhance the results of the visual examination. Panels were rated at 336, 672, 1344, 2016, 2688, 3360, and 4032 hours.

Aluminum Epoxy Mastic Test Results and Discussion

The results of the periodic evaluations of the aluminum epoxy mastic coating systems exposed in the cyclic salt spray test are detailed in Appendix A and summarized in Table 2. Column 2 of Table 2 indicates the first appearance of blistering and the number of panels affected. Blistering at subsequent intervals is similarly indicated. Unless otherwise indicated, blistering occurred adjacent to the scribe and not over the entire face of the panel. First appearance of surface rusting is indicated in column 3 along with number of panels affected. Early rusting is often a good indicator of poor long-term performance. Column 4 shows the results of the rust undercutting analysis performed after completing the cyclic salt spray test. The first number indicates the lowest rating of the six test panels and the second number is the average numerical rating for all six panels. Column 5 lists the average numerical ratings and composite score for each coating system. The numerical rating for blistering is based only on the area adjacent to the scribe and not on the entire facial area of the test panels. The

Table 2. Aluminum epoxy mastic performance in cyclic salt spray test (4032 h).

| Coating System | Blister – Occurrence at Scribe (# Panels) | Rust – First Occurrence (# Panels) | Scribe – Worst / Average Numerical Rating | Numerical – Blister / Rust / Scribe / Total |
|--|---|--|---|--|
| SSPC Paint 25 TT-P-38 | 3360 (6) 4032 (6) | 672 (6) | 7 / 8.8 | 7.2 / 9.2 / 8.8 / 25.2 |
| S-W Ep Mastic Alum II S-W Ep Mastic Alum II | 4032 (0) | 672 (4) | 6 / 6.3 | 10.0 / 9.0 / 6.3 / 25.3 |
| S-W Sur Tol Epoxy S-W Sur Tol Epoxy | 3360 (6) 4032 (6) | 672 (2) | 5 / 5.8 | 5.2 / 9.5 / 5.8 / 20.5 |
| Devoe Bar Rust 239 Devoe Bar Rust 239 | 4032 (6) | 672 (3) | 6 / 6.8 | 7.3 / 9.3 / 6.8 / 23.5 |
| Sigma Colturiet TCP Sigma Colturiet TCP | 3360 (6) 4032 (6) | 672 (1) | 6 / 6.8 | 5.2 / 9.5 / 6.8 / 21.5 |
| International Magna Mastic 7900 (1 coat) | 2016 (2) not just at scribe 2688 (4) 3360 (6) 4032 (6) | 672 (6) | 9 / 9.0 | 5.3 / 1.7 / 9.0 / 16.0 |
| International Intergard Universal Alum (1 coat) | 3360 (6) 4032 (6) | 672 (1) | 6 / 8.0 | 6.5 / 9.5 / 8.0 / 24.0 |
| Carbomastic 15LO Carbomastic 15LO | 3360 (2) 4032 (5) | 672 (1) | 8/9.0 | 6.7 / 9.3 / 9.0 / 25.0 |
| Carbomastic 90 Alum Carbomastic 90 Alum | 4032 (3) | 672 (1) | 9/9.7 | 9.0 / 9.3 / 9.7 / 28.0 |
| S-W Macropoxy Alum S-W Macropoxy Alum | 3360 (6) 4032 (6) | none at 4032 | 4 / 5.7 | 4.2 / 10.0 / 5.7 / 19.9 |
| Hempadur 4515-1987 Hempadur 4515-1987 | 2016 (1) 2688 (1) 3360 (6) 4032 (6) | none at 4032 | 5 / 6.0 | 3.8 / 10.0 / 6.0 / 19.8 |
| Totals all AEM | 2016 (0.3) 2688 (0.5) 3360 (3.8) 4032 (5.0) | 672 (1.9) | 6.6 / 7.3 | 6.3/7.8/7.3/21.4 |
| Control | 3360 (6) 4032 (6) | 672 (6) | 7 / 8.8 | 7.2 / 9.2 / 8.8 / 25.2 |

numerical blister rating is the average of the sum of the numerical ratings for blister frequency and size. Blister frequency is converted as follows: none = 10, few = 8, medium = 6, medium dense = 4, dense = 2, complete = 0. Averages for the 10 aluminum epoxy mastic systems are shown at the bottom of Table 2.

Early blistering is also known to correlate well with inferior long-term performance. On the average, first blistering occurred after 3360 hours of testing. This is true of 5 of the 10 epoxy systems as well as the control. First blistering occurred later (4032 h) or not at all for 3 epoxies and earlier for 2 others. One epoxy system experienced blistering over the entire panel and not just adjacent to the scribe. The final average

blister rating for the group of epoxies was slightly lower than that observed for the control system, 6.3 versus 7.2. Three of the epoxy systems were more resistant to blistering than the control and two of these also had high composite scores.

First rusting typically appeared at the second inspection interval (672 h). This is true of all but two epoxy systems that did not exhibit surface rusting for the duration of the test exposure. Appearance of first rusting did not differ greatly between the control system and epoxy coatings. The average final rust rating of the epoxies was much lower than observed for the control system. However, all but one epoxy system scored near or above the control system while one product offered little corrosion protection in this test. The average rust rating of the nine best epoxies was 9.6.

The average rating for rust undercutting did not deviate drastically between test specimens for a given coating system. The average numerical rating for undercutting the epoxy systems was significantly lower than for the control system, 7.3 versus 8.8. However, three epoxy systems had better resistance to undercutting than the control system and two of these had excellent composite scores.

The average composite score of the aluminum epoxy mastics was significantly lower than the control system, 21.4 versus 25.2. Only two of the epoxy systems outperformed the control system. Overall, six of the aluminum epoxy mastic systems exhibited good to excellent performance, three fair, and only one poor.

3 Evaluation of Epoxy Primer/Urethane Topcoat Systems

Selection of Test Coatings

Ten commercially available epoxy/urethane coating systems were selected for evaluation. The selected systems are American made. The test coatings have a maximum VOC as applied of 340 g/L for the epoxy primer and 450 g/L for the urethane topcoat. The selected coatings are compatible with minimally prepared rusted steel substrates. Table 3 lists the epoxy/urethane coating systems.

Preparation of Test Specimens

Test panels were prepared and coatings were applied in the same manner as described above for the aluminum epoxy mastic coating systems. Standard Corps of Engineers coating system number 16 was applied as a control. This system, described in CWGS-09940, consists of SSPC Paint No. 25 (1st coat) and TT-E-489 (2d and 3d coats). Average dry film thicknesses for each system are listed in Table 3. Dry film thicknesses for individual panels can be found in Appendix B.

Test Methods

Test panels were exposed as described above for the aluminum epoxy mastic coating systems.

Inspection and Evaluation of Test Coupons

The coatings were periodically evaluated as described for the aluminum epoxy mastic coating systems except that panels were rated at 336, 672, 1344, 2016, 2688, and 3360 hours. In addition to corrosion degradation, each test system was evaluated for percent gloss retention. Gloss retention is primarily an appearance consideration and is not necessarily an indicator of coating performance.

Table 3. Epoxy/urethane coating systems.

| Manufacturer | Product Name | VOC (g/L) | Dry Film Thickness (0.001 in) |
|------------------------|--|--------------|-------------------------------|
| Davis Industrial Paint | SSPC Paint 25 TT-P-489 (2 coats) | ~290 <420 | 2.0 2.6/3.2 7.8 (total) |
| Carboline | Carbomastic 90 Carbothane 134HS | 84 288 | 6.0 4.7 10.7 (total) |
| International | Intergard HS Universal Epoxy Interthane | 192 414 | 6.1 3.4 9.5 (total) |
| Devoe | Bar Rust 236 Devthane 379 | 170 327 | 5.0 3.6 8.6 (total) |
| Sherwin-Williams | Surface Tolerant Epoxy High Solids Polyurethane | 174 289 | 6.7 3.0 9.6 (total) |
| Devoe | Bar Rust 239 Devthane 379 | 86 327 | 5.7 3.3 9.0 (total) |
| Hempel | Hempadur 4515/1987 Hempathane 5521/1148 | 180 450 | 8.0 1.9 9.9 (total) |
| Sherwin-Williams | Macropoxy Acrothane | 175 346 | 5.5 2.2 7.7 (total) |
| Sigma Coatings | EPTCP Aluminum VHSA Polyurethane | 240 372 | 6.5 3.9 10.4 (total) |
| Carboline | Carbomastic 15LO Carbothane 134HS | 88 288 | 5.4 6.8 12.2 (total) |
| Devoe | Devran 224 Devthane 379 | 340 327 | 5.1 3.0 8.1 (total) |

Epoxy/Urethane Test Results and Discussion

The results of the periodic evaluations of the epoxy/urethane coating systems exposed in the cyclic salt spray test are detailed in Appendix B and summarized in Table 4. Column 2 of Table 4 indicates the first appearance of blistering and the number of panels effected. Blistering at subsequent intervals is similarly indicated. Column 3 shows the percent gloss retention. Column 4 shows the results of the rust undercutting analysis performed after completion of the cyclic salt spray test.

Table 4. Epoxy/urethane performance in cyclic salt spray test (3360h).

| Coating System | Blister - Occurrence at Scribe (# Panels) | Gloss Retention | Scribe – Worst and Average Numerical Rating | Numerical - Blister / Rust / Scribe / Total |
|--------------------------------------|---|-----------------|---|--|
| SSPC 25 TT-E-489 | 1344 (4) 2016 (6) 2688 (6) 3360 (6) | 58.0% | 5 / 6.7 | 3.6 / 10 / 6.7 / 20.3 |
| Carbomastic 90 Carbothane 134HS | 1344 (0) 2016 (0) 2688 (3) 3360 (3) | 90.4% | 8 / 8.7 | 8.7 / 10 / 8.7 / 27.4 |
| Intergard HS Interthane | 1344 (0) 2016 (0) 2688 (2) 3360 (2) | 94.1% | 8/9.0 | 9.0 / 10 / 9.0 / 28.0 |
| Bar Rust 236 Devthane 379 | 1344 (5) 2016 (6) 2688 (6) 3360 (6) | 92.3% | 5 / 6.7 | 3.7 / 10 / 6.7 / 20.4 |
| S-W Sur Tol Epoxy S-W Hi Sol PU | 1344 (1) 2016 (1) 2688 (2) 3360 (2) | 38.1% | 8 / 8.8 | 9.3 / 10 / 8.8 / 28.1 |
| Bar Rust 239 Devthane 379 | 1344 (5) 2016 (5) 2688 (6) 3360 (6) | 13.7% | 6 / 6.5 | 4.0 / 10 / 6.5 / 20.5 |
| Hempadur 1987 Hempathane 1148 | 1344 (6) 2016 (6) 2688 (6) 3360 (6) | 99.3% | 6/6.8 | 2.8 / 10 / 6.8 / 19.6 |
| S-W Macropoxy S-W Acrothane | 1344 (6) 2016 (6) 2688 (6) 3360 (6) | 70.3% | 5 / 6.2 | 2.7 / 10 / 6.2 / 18.9 |
| Sigma EPTCP Sigma VHSA PU | 1344 (5) 2016 (5) 2688 (5) 3360 (6) | 92.1% | 8 / 8.5 | 5.8 / 10 / 8.5 / 24.3 |
| Carbomastic 15LO Carbothane 134HS | 1344 (0) 2016 (0) 2688 (3) 3360 (3) | 95.4% | 6/7.8 | 8.3 / 10 / 7.8 / 26.1 |
| Devran 224 Devthane 379 | 1344 (5) 2016 (6) 2688 (6) 3360 (6) | 99.3% | 5 / 6.5 | 4.5 / 10 / 6.5 / 21.0 |
| Totals all e/u coatings | 1344 2016 2688 3360 3.30 3.50 4.20 4.30 4 6 6 6 | | 6.5 / 7.5 5.0 / 6.7 | 5.9 / 10 / 7.5 / 23.4 3.6 / 10 / 6.7 / 20.3 |

The first number indicates the lowest rating of the six test panels and the second number is the average numerical rating for all six panels. Column 5 lists the average numerical ratings and composite score for each coating system. The numerical rating

for blistering is based only on the area adjacent to the scribe and not on the entire facial area of the test panels. Averages for the 10 epoxy/urethane systems are shown at the bottom of Table 4.

Early blistering is known to correlate well with inferior long-term performance. On average first blistering occurred after 1344 hours of testing. This is true of seven of the 10 epoxy/urethane systems as well as the control. First blistering occurred later (2688 h) for three epoxy/urethane systems. The final average blister rating for all of the epoxy/urethane systems was significantly higher than that observed for the control system, 5.9 versus 3.6. Eight of the epoxy/urethane systems are more resistant to blistering than the control system. Blistering was only observed adjacent to the scribe and general blistering was not seen for any of the coating systems.

Early rusting in accelerated testing is often a sign of poor long-term performance. None of the epoxy/urethane systems or the control exhibited any surface rusting for the duration of the test.

The average numerical rating for rust undercutting did not deviate drastically between test specimens for a given coating system. The average numerical rating for undercutting for the epoxy/urethane systems was slightly better than for the control system, 7.5 versus 6.7. Seven epoxy/urethane systems have as good or better resistance to undercutting than the control system.

The average percent gloss retention for the epoxy/urethane systems is significantly better than the control system, 78.5 versus 58.0 percent. All but two of the test systems have gloss retentions superior to the control.

The average composite score of the epoxy/urethane systems was significantly higher than the control system, 23.4 versus 20.3. Only two of the epoxy/urethane systems failed to outperform the control system. Overall, five of the epoxy/urethane systems exhibited good to excellent performance and five fair performance.

4 Determination of Coating System Salient Characteristics

Commercial Item Descriptions

GSA authorizes the use of a wide variety of CIDs including those for protective coatings and related materials. GSA is usually the preparing activity for these CIDs, but this is not a requirement. In some cases, a DOD agency is the preparing activity; for example the Navy is the preparing activity for "CID, A-A-50542, Coating System: Reflective, Slip-Resistant, Chemical-Resistant Urethane for Maintenance Facility Floors."

CIDs are flexible procurement documents. There is no single format or prescription, although CIDs prepared by GSA follow a fairly well established format, including a title, description of salient characteristics, certification, regulatory, and packaging, packing, and marking requirements, and in some cases, quantitative requirements. A-A-50542, prepared by the Navy, is much longer than the average GSA-prepared CID and includes additional sections on quality assurance and supply sources. The description of the salient characteristics is the heart of the CID.

Salient Characteristics for Aluminum Epoxy Mastic and Epoxy/Urethane Systems

Appendixes C and D contain draft CIDs for aluminum epoxy mastic and epoxy/ urethane systems for use on minimally prepared atmospherically exposed steel surfaces. The draft CIDs closely follow the format of the Navy prepared CID, A-A-50542, and include an abstract, salient characteristics, notes, and sections on quality assurance and packaging.

The abstract presents a brief description of the product and its intended use. The salient characteristics section presents the requirements for the basic properties and performance requirements for the coating system. The quality assurance section spells out responsibilities, and inspection and certification requirements. The packaging section contains provisions for labeling and packaging, and safety and application data requirements. The notes provide additional relevant information including usage constraints, timeliness for qualification, and sources of products.

The salient characteristics are the most important part of the CID and the rationale behind each of the requirements is therefore also important. The application properties and appearance of the dried paint film provide for defect-free application and curing at the manufacturers' recommended film thickness as applied by commonly used application methods. The dry time requirements are consistent with applying a two-coat system in a 2-day period. The pot life requirements provide for a material that remains usable over a reasonable period of time. Intercoat adhesion requirements ensure that the coating can be successfully topcoated even after a moderate delay in the painting schedule. Requirements for accelerated corrosion assure a level of corrosion protection consistent both with existing Corps painting practices and superior products of the type being evaluated. Requirements for volatile organics ensure compliance with environmental regulations where applicable and with DOD goals associated with pollution prevention.

5 Conclusions and Recommendations

Performance of Aluminum Epoxy Mastics Versus Standard Corps System

Four of the 10 aluminum epoxy mastic systems evaluated meet the performance criteria established in the draft CID. Three of these materials exhibit better overall performance in accelerated corrosion testing than does the standard Corps system for this application. The four products meeting the draft criteria have slightly superior resistance to blistering and slightly inferior resistance to rust undercutting in comparison with the standard Corps system. Rust inhibitive primers, such as those used in the standard Corps system, are more effective at reducing undercutting at film discontinuities and damaged areas than are thick film barrier systems such as epoxies. Conversely, barrier epoxy coatings often provide superior moisture and blister resistance. Overall, coatings complying with the requirements of the draft CID should provide excellent corrosion protection over minimally prepared steel surfaces.

Performance of Epoxy/Urethane Systems Versus Standard Corps System

Four of the 10 epoxy/urethane systems evaluated meet the performance criteria established in the draft CID. Each of these materials exhibit better overall performance in accelerated corrosion testing than does the standard Corps system for this application. Four other systems also outperformed the Corps standard; however, each of these systems exhibited early blistering adjacent to the scribe that progressed to a greater extent than the systems meeting the criteria. Overall, coatings complying with the requirements of the draft CID should provide excellent corrosion protection over minimally prepared steel surfaces.

Commercial Availability

Aluminum epoxy mastic and epoxy/urethane systems are widely available. The products evaluated here represent a small cross section of the available products. CIDs for these systems should make these products widely available to the Corps as well as to other federal end users.

Air Pollution Regulations

Air pollution regulations stemming from the Clean Air Act Amendments of 1990 and earlier legislation place limitations on the amount of volatile organic solvents that paints may contain. The USEPA is working to establish a rule with a national scope for architectural and industrial maintenance coatings. However, at this time the USEPA has not produced a final rule and the exact categorization and allowable VOC contents are subject to speculation. Existing and proposed rules in California and other states offer a more well-defined target. A review of USEPA deliberations and proposed and existing state and local rules suggests an upper limit of 340 g/L for industrial maintenance coatings. This limit is recommended for the aluminum epoxy mastic system and the epoxy primer of the epoxy/urethane system. Half of the urethane topcoats evaluated either approach or exceed the 340 g/L level. An interim VOC level of 420 g/L for the urethane topcoat is recommended.

General Services Administration

It is recommended that the draft CIDs for aluminum epoxy mastic and epoxy/urethane systems be submitted to GSA for coordination, review, and authorization.

Corps of Engineers

It is recommended that the Corps revise CWGS-09940 to include the subject CIDs. The CIDs should be established as alternatives to systems number 2 and 16 of CWGS-09940.

Bibliography

Cited

- ASTM D 610, Standard Method for Evaluating Degree of Rusting on Painted Surfaces (American Society for Standards and Materials [ASTM], Philadelphia, PA, 1989).
- ASTM D 714, Standard Test Method for Evaluating Degree of Blistering of Paints (ASTM, 1987).
- ASTM D 1654, Standard Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments (ASTM, 1992).
- ASTM G 53, Standard Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials (ASTM, 1991).
- ASTM G 85, Standard Practice for Modified Salt Spray (Fog) Testing, Annex A5. Dilute Electrolyte Cyclic Fog/Dry Test (ASTM, 1994).
- Commercial Item Description (CID) A-A-500542, Coating System: Reflective, Slip-Resistant, Chemical-Resistant Urethane for Maintenance Facility Floors (1993).
- Corps of Engineers Guide Specification CE-1409, Painting: Hydraulic Structures and Appurtenant Works (Headquarters, U.S. Army Corps of Engineers [HQUSACE], Washington, DC, June 1973, March 1968).
- Civil Works Guide Specification CWGS-09940, Painting: Hydraulic Structures and Appurtenant Works (June 1993, October 1992, August 1989, August 1981, April 1981, November 1979, January 1977).
- Federal Specification TT-E-489, Enamel, Alkyd, Gloss, Low VOC Content (1994).
- Federal Specification TT-P-38, Paint, Aluminum, Ready-Mixed (1985).
- Federal Specification TT-P-86, Paint, Red-Lead-Base, Ready-Mixed (1987).
- SSPC Paint Specification 25, Red Iron Oxide, Zinc Oxide, Raw Linseed Oil and Alkyd Primer (Steel Structure Painting Council [SSPC], Pittsburgh, PA, 1991).
- SSPC SP-1, Solvent Cleaning (SSPC, 1982).
- SSPC SP-2, Hand Tool Cleaning (SSPC, 1982 and 1989 editorial changes).
- SSPC SP-3, Power Tool Cleaning (SSPC, 1982 and 1989 editorial changes).

SSPC-SP-5, White Metal Blast Cleaning (SSPC, 1985 and 1991 editorial changes).

SSPC SP-6, Commercial Blast Cleaning (SSPC, 1985 and 1991 editorial changes).

SSPC SP-7, Brush-off Blast Cleaning (SSPC, 1985 and 1991 editorial changes).

SSPC SP-10, Near-White Metal Blast Cleaning (SSPC, 1985 and 1991 editorial changes).

SSPC-VIS 1, Visual Standard for Abrasive Blast Cleaned Steel (SSPC, 1989).

SSPC-VIS 2, Standard Method of Evaluating Degree of Rusting on Painted Surfaces (SSPC, 1982).

Uncited

Federal Specification TT-P-615, Primer Coating: Basic Lead Silico Chromate (canceled).

- Hare, C.H., "Effect of Aluminum Pigmentation on the Anti-Corrosive Properties of Barrier Primers," Journal of Protective Coatings and Linings, vol 7, No. 2 (February 1990).
- Hare, C.H., "Barrier Coatings," Journal of Protective Coatings and Linings, vol 6, No. 2 (February 1989).
- Kapsanis, K.A., and B.A. Appleman, "Myths and Realities of Surface-Tolerant Coatings for Bridges," Journal of Protective Coatings and Linings, vol 9, No. 9 (January 1992).
- Thomas, N.L., "The Protective Action of Coatings on Rusty Steel," Journal of Protective Coatings and Linings, vol 6, No. 12 (December 1989).
- Simpson, C.H., C.J. Ray, and B.S. Skerry, "Accelerated Corrosion Testing of Industrial Maintenance Paints Using a Cyclic Corrosion Weathering Method," *Journal of Protective Coatings and Linings*, vol 8, No. 5 (May 1991).

Appendix A: Aluminum Epoxy Mastic Test Results

| US ARMY CORP OF ENGINEERS | ALUMINU | ALUMINUM EPOXY MASTIC PROGRAM |
|----------------------------|--|-------------------------------|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | CARBOMASTIC 15L0 | |
| MANUFACTURER | CARBOLINE | |
| VOLUME % SOLIDS | 90% +/- 2% | |
| VOC | 0.74 LB/GAL (88 G/L) | |
| POT LIFE | 4 HOURS @ 75F | |
| INDUCTION TIME | NONE | |
| DRYING TIME MINIMUM | RECOAT 24 HOURS @ 75F / FULL CURE 5 DAYS @ 75F | JURE 5 DAYS @ 75F |
| RECOMMENDED FILM THICKNESS | MILS PER COAT : DRY 5.7 / WET 5.5-7.5 | .5-7.5 |
| MIXING RATIOS | 1 PART A: 1 PART B BY VOLUME | |
| THINNING | | |
| APPLICATION DATA | l 1st COAT | 2nd COAT |
| DATE/TIME | 3/9/93 @ 1:00 P.M. | 3/10/93 @ 2:00 P.M. |
| ВН | 25% | 63% |
| TEMPERATURE | 72F | 73F |
| SUBSTRATE CONDITION | SSPC VIS 1-C @ 2.0 MILS PROFILE | CARBOMATIC 15L0 |
| COATING BATCH NUMBERS | A: 23A7722L/B: 3A7697L | A: 3A7722L / B: 3A7697L |
| THINNING | #76@ 20% | #76 @ 20% |
| EQUIPMENT | DEVILBISS MBC 704E | DEVILBISS MBC 704E |
| NUMBER OF COATS | 181 | 2ND |
| SAG INDEX | > 24 MILS / 9 MILS THINNED 20% | 9 MILS THINNED 20% |
| | | |
| DRY FILM THICKNESS, MILS | T 1st COAT | 2nd COAT TOTAL |
| SAMPLE 55 | 4.6 | 10.6 |
| SAMPLE 56 | 5.3 | |
| SAMPLE 57 | 5.4 | |
| SAMPLE 58 | 5.2 | 9.6 |
| SAMPLE 59 | 4.8 | |
| SAMPLE 60 | | |

| | | | • | | | |
|--|----|-------|--|-----------------------|---|-----------------------------|
| |] | | 10.000 | | 20 - 10 - 10 - 10 - 10 - 10 - 10 - 10 - | |
| CLIENT: U.S. Army Corp of Eng. | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | |
| DATE: 4/5/93 | | | | | | |
| EVALUATION HOURS: 336 | | | | | | |
| COATING EVALUATION DATA | | | _ | | | COMMENTS |
| COUNTY OF A PARTY | 22 | 56 | 57 | 58 | 59 | 09 |
| IEST PANEL NUMBER | | | | | | There are no visible |
| ACTM DE10 Blist CBADE | 0 | 0 | 0 | 0 | 0 | O changes on any panels in |
| ASTIM DOTO NOST GRADE | | | | | | this set after 336 hours of |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | O exposure. |
| | | | | | | 1 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN OBSEDACE SOOM SCRIBE | | | | | | |
| MEAN CREETAGE TROM SCRIBE, TABLE 1, INCHES | | FIN | AL EVALUA | FINAL EVALUATION ONLY | - | |
| MACAN CREEDACE FROM CORDE | | | | | | |
| TABLE 1 BATING NI MARER | | FINAL | EVA | LUATION ONLY | Υ | |
| Able 1, nating womber | | | | | | |
| RATING OF UNSCRIBED AREAS, | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2 RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |

| PANEL EVALUATION | | | | CARI | CARBOMASTIC 15LO | TIC 151 | 0 |
|---|-----|----|-----------|-----------------------|------------------|---------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | I . | | | | | | |
| DATE: 4/19/93 EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 55 | 56 | 57 | 58 | 59 | 09 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SHR JECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | INAL EVA | FINAL EVALUATION ONLY | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2. % FAILED | 0 | 0 | 0 | 0 | 0 | ×1% | |
| TABLE 2. RATING # OF UNSCRIBED AREAS | 10 | 10 | 101 | 10 | 10 | 6 | |
| | | | | | | | |

| |]- | | | | | | |
|---|----|-------|-------------------|----------------|-------|----------|--|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 5/17/93 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS | |
| TEST PANEL NUMBER | 22 | 56 | 57 | 28 | 29 | 09 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | _ | _ | | _ | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | AL EVALUATION ONE | LION ONLY | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVALUA | EVALUATION ONL | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | <1% | %1× | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 6 | 6 | |

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| | | | | CAND | ייייייייייייייייייייייייייייייייייייייי | CARBOINIASTIC 13EO | |
|---|----|-------|-------|----------------|---|--------------------|--|
| CLIENT: U.S. Army Corp of Eng. | 1 | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| UAIE: 0/14/93 | 1 | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | | |
| COATING EVALUATION DATA | _ | | | | | | COMMENTS |
| TEST PANEL NUMBER | 55 | 29 | 57 | 58 | 59 | 09 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | 1 | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | FINAL | | EVALUATION ONL | ١٢٨ | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | FINAL | 1 .11 | EVALUATION O | ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | <1% | ×1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | б | 6 | 6635464544464544444555156666666666666666 |
| | | | | | | | |

| PANEL EVALUATION | | | | | | | |
|---|--------|-------|------|-----------------|-------------|-------|----------|
| |] ¬ | | | | | | |
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | 1 | | | | | | |
| DATE: 7/12/93 | | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 22 | 26 | 57 | 28 | 29 | 09 | |
| ASTM D610 RUST GRADE | 0.10% | 0 | 0 | 0 | 0.10% | 0.10% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE. | | | | | | | |
| TABLE 1, INCHES | | FINAI | 111 | EVALUATION ONLY | _ | | |
| MEAN CREEPAGE FROM SCRIBE. | | | | | | | |
| TABLE 1, RATING NUMBER | | FINA | 1 11 | EVALUATION ONLY | > | | |
| | | | | | | | |
| RATING OF UNSCRIBED AREAS, | /10/ | 0 | c | C | <1% | <1% | |
| TABLE 2, % FAILED | 0/17 | > | | , | | | |
| TARIF 2 RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | 6 | 6 | |
| | | | | | | | |

| PANEL EVALUATION | | | | CARB | JMAST | CARBOMASTIC 15LO | |
|--|-------|-------|------------|-------------------|--------------|------------------|----------|
| CLIENT: U.S. Army Corp of Eng. | 1 | | | | | | |
| DATE: 8/9/93 | | | | | | | |
| EVALUATION HOURS: 3360 | | | | | | | |
| COATING EVALUATION DATA | _ | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 55 | 26 | 57 | 28 | 59 | 09 | |
| ASTM D610 RUST GRADE | 0.10% | 0 | 0 | 0.03% | 0.10% | 0.10% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 8 | 80 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED | - | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | 1 11 | | > | | |
| TABLE 1, INCHES | | FINAL | 111 | EVALUA I ION ONLY | A L | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FIN | FINAL EVAL | EVALUATION | ONLY | | |
| | | | | | | | |
| TABLE 2, % FAILED | <1% | 0 | 0 | ×1% | ×1× | %L> | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 6 | 6 | 6 | |
| | | | | | | | |

| DANEI EVALUATION | | | | CARB | CARBOMASTIC 15LO | C 15L | 0 |
|--|-------|-------|-------|-------|------------------|-------|---|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| EVALUATION HOURS: 4032-Final COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | 55 | 26 | 57 | 28 | 29 | 09 | Blistering has occurred |
| ASTM D610 RUST GRADE | 0.10% | 0 | 0 | 0.03% | 0.10% | 0.10% | 0.10% only along the scribe |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 9 | 4 | 4 | 4 | 9 | edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 Few | Few | | Faw | Med | Med | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 0 | 1/64" | 1/64" | 1/64" | 1/32" | 1/64" | Loss of adhesion and underfilm rust creepage |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 10 | 6 | 6 | 6 | 8 | | from scribe has occurred 9 only under blisters. |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | <1% | <1% | ×1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 6 | 6 | | 6 |
| | | | | | | | |

| US ARMY CORP OF ENGINEERS | ALUMINU | ALUMINUM EPOXY MASTIC PROGRAM |
|----------------------------|--|--|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | CARBOMASTIC 90 ALUMINUM (RE | CARBOMASTIC 90 ALUMINUM (REPLACES KOPCOTE ALUMINUM MASTIC) |
| MANUFACTURER | CARBOLINE | |
| VOLUME % SOLIDS | 90% +/- 2% | |
| Voc | 0.70 LB/GAL (84 G/L) | |
| POT LIFE | 4 HOURS @ 75F | |
| INDUCTION TIME | | |
| DRYING TIME MINIMUM | RECOAT 12 HOURS @ 75F / FULL CURE 2 DAYS @ 75F | CURE 2 DAYS @ 75F |
| RECOMMENDED FILM THICKNESS | MILS PER COAT : DRY 5 / WET 5.5 | |
| MIXING RATIOS | 1 PART A: 1 PART B BY BOLUME | |
| THINNING | #2 THINNER @ 25% MAXIMUM | |
| | | |
| APPLICATION DATA | 1st COAT | 2nd COAT |
| DATE/TIME | 3/11/93 @ 1:00 P.M. | 3/12/93 @ 1:00 P.M. |
| ВН | 52% | 61% |
| TEMPERATURE | 72F | 75F |
| SUBSTRATE CONDITION | @ | CARBOMASTIC 90 ALUMINUM |
| COATING BATCH NUMBERS | A: 2K3751M / B: 2H3301M | A: 2K3751M / B: 2H3301M |
| THINNING | #2·@ 25% | #2 @ 25% |
| EQUIPMENT | DEVILBISS MBC 704E | DEVILBISS MBC 704E |
| NUMBER OF COATS | 1ST COAT | 2ND COAT |
| SAG INDEX | 20 MILS | 20 MILS |
| | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT TOTAI |
| SAMPLE 61 | 5.2 | 6 11.2 |
| SAMPLE 62 | 5.1 | |
| SAMPLE 63 | 4.48 | 5,4 |
| SAMPLE 64 | 5.2 | 10.2 |
| SAMPLE 65 | 5.8 | 1 |
| SAMPLE 66 | | |

| DANEI EVALUATION | | | CARBC | CARBOMASTIC 90 ALUMINUM | 90 ALI | UMINUM |
|---|----------|-------|-------------|-------------------------|--------|--|
| |)] | | | | | |
| CCIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | |
| DATE: 4/5/93 | | | | | | |
| EVALUATION HOURS: 336 | | | | | | |
| COATING EVALUATION DATA | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 91 | 62 | 63 | 64 | 65 | 99 |
| ACTA DETO BLICE CBADE | 0 | 0 | 0 | 0 | 0 | O There are no visible |
| ASTIN DOLO ROOF GIVE | | • | • | C | c | changes on any panels O in this set after 336 hours of |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | > | P | | exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBJECTED | <u> </u> | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | 1 11 111 | EVALUATION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | i i | CINAL EVALU | EVALUATION ONLY | | |
| TABLE 1, RATING NUMBER | | Ē | ıII - | The second second | | |
| RATING OF UNSCRIBED AREAS, | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

| PANEL EVALUATION | | | CARE | 30MAS | ric 90 | CARBOMASTIC 90 ALUMINUM | |
|---|----|-------|--------|----------------|------------|-------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/19/93 | | | | | | | |
| EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | | | | CON | COMMENTS |
| TEST PANEL NUMBER | 19 | 62 | 63 | 64 | 65 | 99 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0.03% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| O CORRUSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | FINAL | 1 . 31 | EVALUATION ONL | ≻ . | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | FINAL | 11 .11 | EVALUATION ONL | | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 6 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | CARB | CARBOMASTIC 90 ALUMINUM | IC 90 A | LUMIN | NM |
|--|-----|-------|-----------------------|-------------------------|---------|-------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 5/17/93 EVALUATION HOURS: 1344 | | | | 1 | | | COMMENTS |
| TEST PANEL NUMBER | 61 | 62 | 63 | 64 | 65 | 99 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0.10% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FIN | FINAL EVALUATION ONLY | TION ON | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAI | AL EVALUATION | ATION ONLY | <u></u> | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 101 | 10 | 10 | 6 | 10 | |

| PANEL EVALUATION | | S | ARBON | IASTIC | 90 ALL | CARBOMASTIC 90 ALUMINUM | |
|--|----|-------|------------|-----------------|--------|-------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 6/14/93 | | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | | |
| COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | 19 | 62 | 63 | 64 | 65 | 99 | |
| ASTM D610 RUST GRADE | 0 | 0.03% | 0 | 0.03% | 0.10% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COALED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, | | | 1 11 | | | | |
| TABLE 1, INCHES | | FINAL | , 11 | EVALUATION | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | Ē. | FINAL EVAL | EVALUATION ONLY | ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | <1% | 0 | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 10 | တ | 6 | 10 | |
| | | | | | | | 7 |

| DANEL EVALUATION | | | CARBC | MAST | C 90 ALI | CARBOMASTIC 90 ALUMINUM | |
|--|----|-------|-----------------------|------------|----------|-------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| DATE: 7/12/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 91 | 62 | 63 | 64 | 65 | 99 | |
| ASTM D610 RUST GRADE | 0 | 0.10% | 0.03% | 0.10% | 0.10% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVALUATION ONLY | UATION | JNLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | <1% | <1% | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 6 | 6 | 6 | 10 | |

| PANEL EVALUATION | | | CARE | SOMAS | CARBOMASTIC 90 ALUMINUM | LUMIN | UM |
|--|----|-------|-----------|-----------------|-------------------------|-------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| EVALUATION HOURS: 3360 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 61 | 62 | 63 | 64 | 65 | 99 | |
| ASTM D610 RUST GRADE | 0 | 0.10% | 0.03% | 0.10% | 0.10% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEANS CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVA | EVALUATION | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EV. | EVALUATION ONLY | 1 ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | <1% | ×1% | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 6 | | 6 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | CARB | OMAST | IC 90 AL | CARBOMASTIC 90 ALUMINUM | |
|---|-----|-------|-------|-------|----------|---------------------------|-------------|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| EVALUATION HOURS: 4032-Final | | | | | | | |
| COATING EVALUATION DATA | | | | | | COM | COMMENTS |
| TEST PANEL NUMBER | 61 | 62 | 63 | 64 | 65 | 99 | |
| POACO TOLIC CASCALLACT | 0 | 0.10% | 0.03% | 0.10% | 0.10% | 0 | |
| ASTM D610 RUSI GRADE | | | | | | Bl;istering has occurred | occurred |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | ω | 8 | 0 | 0 | O only along scribe edges | edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Few | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| AND COEEDAGE COOM SCRIBE | | | | | | | |
| TABLE 1 INCLES | 0 | 1/64" | 1/64" | 0 | 0 | 0 | |
| I ABLE 1, INCHES | | | | | | The only loss of adhesion | of adhesion |
| MEAN CREEDAGE FROM SCRIRE | | | | | | and underfilm rusting | rusting |
| TARIF 1 RATING NUMBER | 10 | 6 | 6 | 10 | 10 | 10 from the scribe has | s has |
| | | | | | | occurred under blisters | r blisters. |
| RATING OF UNSCRIBED AREAS, | | | | | 3 | | |
| TABLE 2, % FAILED | 0 | ×1× | <1% | <1% | %[\ | 0 | |
| TADE O DATING # OF HINSCRIBED AREAS | 102 | 6 | 6 | 6 | 6 | 10 | |
| TABLE 2, BATTING # OF OTOGOTOPO CONTEST | | | | | | | |
| | | | | | | | |

| US ARMY CORP OF ENGINEERS | | ALUMINUM EPOX | ALUMINUM EPOXY MASTIC PROGRAM | AM |
|----------------------------|-------------------------------|---|-------------------------------|-----------|
| | | | | |
| COATING STSIEM DATA | METAL PRIMER SSPC25 RED OXIDE | 25 RED OXIDE | INDUSTRIAL ALUMINUM TT-P-38 | I TT-P-38 |
| MANUFACTURER | DAVIS INDUSTRIAL COATING | OATING | DAVIS INDUSTRIAL COATING | TING |
| VOLUME % SOLIDS | NOT AVAILABLE | | NOT AVAILABLE | |
| 000 | NOT AVAILABLE | *************************************** | NOT AVAILABLE | |
| POT LIFE | NOT AVAILABLE | | NOT AVAILABLE | |
| INDUCTION TIME | NOT AVAILABLE | | NOT AVAILABLE | |
| DRYING TIME MINIMUM | NOT AVAILABLE | | NOT AVAILABLE | |
| RECOMMENDED FILM THICKNESS | NOT AVAILABLE | | NOT AVAILABLE | |
| MIXING RATIOS | SINGLE COMPONENT | | SINGLE COMPONENT | |
| THINNING | T-120 SPRAYING THINNER | NNER | t-120 SPRAYING THINNER | ER |
| APPLICATION DATA | 1ST COAT | 2ND COAT | 3RD COAT | |
| DATE/TIME | 3/11/93 @ 9:00 AM | 3/12/93 @ 2:00 PM | 3/13/93 @ 2:00 PM | |
| RH | 61% | 55% | 80% | |
| TEMPERATURE | 75F | 70F | 71F | |
| SUBSTRATE CONDITION | SSPC VIS1-C@2 MILS | SSPC SP5 RED OXIDE | TT-P-2-38 Aluminum | |
| COATING BATCH NUMBERS | 07172139, LOT 793 | UHA10993C | UHA10993C | |
| THINNING | NONE | NONE | NONE | |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL | BINKS CONENTIONAL | |
| NUMBER OF COATS | | 15T | 2ND | |
| SAG INDEX | 4 MILS | 3 MILS | 3 MILS | |
| | | | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT | 3rd COAT | TOTAL |
| SAMPLE 33 | 2 | 1.3 | 1.9 | 5.2 |
| SAMPLE 34 | 2.4 | 1.1 | 2.4 | 5.9 |
| SAMPLE 35 | 2.1 | 1.3 | 2 | 5.4 |
| SAMPLE 36 | 2.5 | 1.4 | 2.2 | 6.1 |
| SAMPLE 37 B* | 2.2 | 1.6 | 1.9 | 5.7 |
| SAMPI F 38 B | 2.2 | 1.2 | 2.1 | ລີ |

| PANEL EVALUATION | | | SSP | SSPC 25 / TT-P-38 | T-P-38 | | |
|--|----|-------|-----|-------------------|---------|-----------------------------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/5/93 | | | | | | | |
| EVALUATION HOURS: 336 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 33 | 34 | 35 | 36 | 37B | 38B | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There is no | There is no visible changes |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | on any pan O after 336 h | on any panels in this set after 336 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | _ | _ | _ | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | | EVALUATION ONL | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | EVALUATION ONLY | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | | | | SSP | SSPC 25 / TT-P-38 | IT-P-38 | |
|--|-------|-------|------------|--------------|-------------------|---------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 4/19/93 | | | | | | | |
| EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 33 | 34 | 35 | 36 | 37B | 38B | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | _ | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVAI | EVALUATION (| ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | o | 6 | |

| PANEL EVALUATION | | | | いつい | SSPC 25 / 11-P-38 | 1-F-30 | |
|---|-------|-------|-----------|-----------------|-------------------|--------|---|
| | 1 | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 5/17/93 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | o Time Time Time Time Time Time Time Time |
| COATING EVALUATION DATA | | | | | | | COMMENIS |
| TEST PANEL NUMBER | 33 | 34 | 35 | 36 | 37B | 38B | |
| ASTM D610 RUST GRADE | 0,03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVA | EVALUATION (| ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TARI F 1. RATING NUMBER | | | FINAL EVA | EVALUATION ONL' | ONLY | | |
| | | | | | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 0 | 6 | o | σ | 6 | 6 | |

| PANEL EVALUATION | | | S | SPC 25 | SSPC 25 / TT-P-38 | 38 | |
|--|-------|-------|-----------------------|------------|-------------------|-------|--|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 6/14/93 | | | | | | | |
| EVALUATION HOURS: 2016 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 33 | 34 | 35 | 36 | 37B | 388 | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | There are no visible 0.03% changes on any panels in |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | this set since previous (1344 hr.) evaluation. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVALUATION ONLY | UATION | NLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | o · | 6 | 6 | 6 | |

| PANEL EVALUATION | | | SS | SSPC 25 / TT-P-38 | 1-F-32 | | |
|---|-------|-------|------------|-------------------|--------|-------|----------|
| C.I.FNT: U.S. Army Corp of Eng. | 1 | | | | | | \$ |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 7/12/93 | 1 | | | | | | |
| EVALUATION HOURS: 2000 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 33 | 34 | 35 | 36 | 37B | 38B | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ACTIVITIES EVALUATION OF BAINTED | ſ | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVAI | EVALUATION ONLY | NLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | - I II | | | | |
| TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS. | | | | | | | |
| TABLE 2, % FAILED | <1% | <1% | <1% | <1% | ×1% | ×1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | 6 | 6 | |

| Eng. S PROGRAM S0 | | ###################################### | | | | | |
|--|-----|--|----------|-----------------|-------|-------|-------------------------------|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | _ | | | | | | COMMENTS |
| | 33 | 34 | 35 | 36 | 37B | 38B | |
| | | | | | | | Blistering has occurred |
| ASTM D610 RUST GRADE 0.03% | | 0.10% 0 | 0.10% | 0.03% | 0.03% | 0.03% | 0.03% only along the edges of |
| | | | | | | | the scribe. |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 80 | 8 | 8 | 8 | 00 | 9 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY Fe | Few | Few | Med | Dense | Med | Few | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | FINAL | IL EVALL | EVALUATION ONLY | NLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | - | FINAL | 1 .11 | EVALUATION (| ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| | <1% | <1% | ×1% | <1% | <1% | <1% | .0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | 6 | | 6 |

| Final | PANEL EVALUATION | · | | | SSPC | SSPC 25 / TT-P-38 | r-P-38 | | |
|--|---|----------|-----------|------------|---------------------------------------|-------------------|--------|------|---|
| 33 34 35 36 37B 0.03% 0. | CLIENT: U.S. Army Corp of Eng. | 1 | | | | | | | |
| NG, SIZE NG, SIZE NG, SIZE REQUENCY Few Few Med Dense Med Construction of the property of | DATE: 9/6/93 | | | | | | | | |
| ADDETA A | EVALUATION HOURS: 4032-Final | | | | | | | | |
| ADE | COATING EVALUATION DATA | | | | | | | | COMMENTS |
| 10 0.03% 0.10% 0.03% 0.0 | TEST PANEL NUMBER | 33 | 34 | 35 | 36 | | | | |
| Second S | ASTM D610 RUST GRADE | 0.03% | 0.10% | 0.10% | 0.03% | | | 3% 8 | All blistering occurred slong scribe edges. |
| Few Few Med Dense Med | ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 8 | ω | | | 8 | 00 | |
| CC Steel | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Med | Dens | | | Few | 50-31 555 12 0-4415464 (505057 19844 1984-0494-0494-04040 (2017), 2010-0494-0 |
| C/Steel C/St | | | | | | | | | |
| C C C C C C C C | ASTM D1654 EVALUATION OF PAINTED | | | | | | | | |
| C/Steel C/St | OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | _ | | |
| Section Sect | ALL AN OPERBACE FORM CODIDE | IC/Steel | IC/Steel | IC/Steel | IC/Steel | IC/Stee | + | teel | |
| 0 10 0 9 0 9 0 7 0 0 0 0 0 0 0 0 | TABLE 1 INCHES | >5/8 0 | 5/8+ 1/84 | 5/8 + 1/84 | 5/8+ 1/84 | 6/8 + 1/6 | T | /84 | |
| O 10 0 9 0 9 0 7 0 0 0 0 0 0 0 0 | יייייייייייייייייייייייייייייייייייייי | | | | | | | | Blistering along scribe |
| O 10 0 9 0 9 0 7 0 0 0 0 0 0 0 0 | MEAN CREEPAGE FROM SCRIBE. | | | | | | | • | edges was between primer |
| C1% C1% C1% C1% C1% C1% BED AREAS 9 9 9 9 | TABLE 1 RATING NUMBER | | - | | | 0 | _ | | and top coat. Loss of |
| <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% <1% | | | | | | | | | adhesion between primer |
| C C C C C C C C C C | RATING OF UNSCRIBED AREAS. | | | | | | | | and steel as well as under |
| OF UNSCRIBED AREAS 9 9 9 10 | TARIE 2 % FAILED | <1% | | <1% | <19 | | | 12% | <1% film rust creepage was very |
| 6 6 6 6 | יסטרו בי יסי מידיני | | | | | | | _ | minimal. |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | 6 | 10 | |
| | | | | | | | | | |

| US ARMY CORP OF ENGINEERS | ALUMINU | ALUMINUM EPOXY MASTIC PROGRAM | |
|----------------------------|---|-------------------------------|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | BAR RUST 239 EPOXY ALUMINUM MASTIC | M MASTIC | |
| MANUFACTURER | DEVOE COATINGS | | |
| VOLUME % SOLIDS | %06 | | *************************************** |
| VOC | 0.72 LB/GAL (86 G/L) | | |
| POT LIFE | 4 HOURS @ 77F | 4. | *************************************** |
| INDUCTION TIME | 15 MIN @ 77F | | *************************************** |
| DRYING TIME MINIMUM | RECOAT 8 HOURS @ 77F / FULL CURE 24 HOURS @ | CURE 24 HOURS @ 77F | *************************************** |
| RECOMMENDED FILM THICKNESS | MILS PER COAT : DRY 6-8 / WET 6.7-8.9 | 6.7-8.9 | 4 |
| MIXING RATIOS | 1 PART A: 1 PART B BY VOLUME | | *************************************** |
| THINNING | T-4 THINNER @ 10% MAXIMUM | | |
| APPLICATION DATA | l 1st COAT | 2nd COAT | |
| DATE/TIME | 3/12/93 @ 10:00 A.M. | 3/13/93 9:00 A.M. | |
| RH | - 61% | | |
| TEMPERATURE | | 71F | |
| SUBSTRATE CONDITION | SSPC VIS 1-C @ 2.0 MILS PROFILE | BAR RUST 239 | |
| COATING BATCH NUMBERS | A: N210202 / B: N210161 | | |
| THINNING | T-4 @ 10% | T-4 @ 10% | |
| EQUIPMENT | DEVILBISS MBC 704E | DEVILBISS MBC 704E | |
| NUMBER OF COATS | 1ST COAT | 2ND COAT | |
| SAG INDEX | >22 MILS | > 22 MILS | Ì |
| | | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT | TOTAL |
| SAMPLE 19 | 5.5 | 7.4 | 12.9 |
| SAMPLE 20 | 7 | 8,4 | 15.4 |
| SAMPLE 21 | 5.5 | 8.8 | 14.3 |
| SAMPLE 22 | 9.9 | 11.1 | 17.7 |
| SAMPLE 23 | 7.6 | | 15.8 |
| SAMPIF 24 | 5.1 | 5.4 | 10.5 |

| NEGRAM A TERING, SIZE O O O O O O O O O O O O O | PANEL EVALUATION | | BA | H HUSI | 100 | | BAR RUSI 233 LT UNI ALCIMINATINI INTO IL |
|--|--------------------------------------|----|-------|-----------|------------|----|--|
| 19 20 21 22 23 | ng. PROGRAM | | | | | | |
| 19 20 21 22 23 | | | | | | | 72 |
| ADE OF BLISTERING, SIZE OF B | NG EVALUATION DATA | _ | | _ | | | COMMENTS |
| DUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ANEL NUMBER | 19 | 20 | 21 | 22 | 23 | 24 |
| DUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible |
| | D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | O in this set after 336 hours |
| FINAL EVALUATION ONLY FINAL FINAL EVALUATION ONLY FINAL FINAL EVALUATION ONLY FINAL FINA | D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| FINAL EVALUATION ONLY FINAL EVALUATION ONLY O O O O O | D1654 EVALUATION OF PAINTED | | | | | | |
| FINAL EVALUATION ONLY FINAL EVALUATION ONLY O 0 0 0 0 | RROSIVE ENVIRONMENTS | | _ | | - | | |
| RIBE, FINAL EVALUATION ONLY EAS, 0 0 0 0 0 | CREEPAGE FROM SCRIBE, | | FINA | IL EVALUA | TION ONLY | | |
| 0 0 0 | CREEPAGE FROM SCRIBE, | | H. N. | 1 11 11 | ATION ONL' | | |
| | G OF UNSCRIBED AREAS, | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS 10 10 10 10 10 | E 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

| PANEL EVALUATION | | | BAR RU | ST 239 | EPOXY | BAR RUST 239 EPOXY ALUMINUM MASTIC | STIC |
|--|----|-------|------------|-----------------|-------|------------------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/19/93 EVALUATION HOURS: 672 COATING EVALUATION DATA | | | | | | 50 | COMMENTS |
| TEST PANEL NUMBER | 19 | 20 | 21 | 22 | 23 | 24 | |
| ASTM D610 RUST GRADE | 0 | 0.03% | 0.03% | 0.03% | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONL | NLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION ONLY | NLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | <1% | <1% | <1% | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 6 | 6 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | BAR RU | ST 239 | EPOXY | ALUMIN | BAR RUST 239 EPOXY ALUMINUM MASTIC |
|--|----|-------|------------|-----------------|-------|--------|------------------------------------|
| | P. | | | | | | |
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| DATE: 5/17/93 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 19 | 20 | 21 | 22 | 23 | 24 | |
| ASTM D610 RUST GRADE | 0 | 0.03% | 0.03% | 0.03% | 0.03% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEDAGE FROM SCRIBE | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONL | NLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION ONLY | ONLY | | |
| A POLICE AND A POL | | | | | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | <1% | <1% | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 6 | 6 | 6 | 101 | |
| | | | | | | | |

| PANEL EVALUATION | | | BAR RU | IST 239 | EPOXY | ALUMIN | BAR RUST 239 EPOXY ALUMINUM MASTIC |
|---|----|-------|------------|----------------|--------------|--------|------------------------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 6/14/93 EVALUATION HOURS: 2016 | | | *** | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 19 | 20 | 21 | 22 | 23 | 24 | |
| ASTM D610 RUST GRADE | 0 | 0.03% | 0.03% | 0.03% | 0.03% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONL | JNLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | <1% | <1% | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 6 | 6 | o o | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | BAR RU | IST 23 | EPOXY | ALUMIN | BAR RUST 239 EPOXY ALUMINUM MASTIC |
|--|----|-------|-----------|-----------------|--------------|--------|------------------------------------|
| CLIENT: U.S. Army Corp of Eng. AI LIMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 7/12/93 | | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 19 | 20 | 21 | 22 | 23 | 24 | |
| ASTM D610 RUST GRADE | 0 | 0.03% | 0.03% | 0.03% | 0.03% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | - | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVA | EVALUATION ONL' | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | <1% | <1% | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 0 | 6 | σ | σ. | |

| PANEL EVALUATION | | | BAR RU | ST 238 | EPOXY | BAR RUST 239 EPOXY ALUMINUM MASTIC | MASTIC |
|---|--------|-------|--------|--------|--------------|------------------------------------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 9/13/93 | | | | | | | |
| EVALUATION HOURS: 4032-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 19 | 20 | 21 | 22 | 23 | 24 | |
| ASTM D610 RUST GRADE | 0 | 0.03% | 0.03% | 0.03% | 0.03% | 0 Blistering | Blistering has occurred |
| ASTM D714 DEGREE OF BLISERING, SIZE | 8 | 8 | 4 | 9 | œ | only along 8 on this se | only along the scribe edges on this set of panels. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Medium | Few | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | >1/16" | 1/16" | <1/8" | 1/8" | <1/16" | 1/64 | |
| | | | | | | Loss of ac | Loss of adhesion and |
| MEAN CREEPAGE FROM SCRIBE, | | ٢ | | 9 | | dinderilling of | underniini rust creepage |
| I ABLE I, KAIING NUMBER | | , | 0 | | | | ters. |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | <1% | <1% | <1% | <1% | 0 | |
| | | | | | | | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 6 | 6 | o | ກ | 101 | |
| | | | | | | | |

| I S ARMY (CRP OF ENGINEERS | | ALUMINUM EPUAT MASTIC PROGRAM | |
|----------------------------|---------------------------------|---|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | HEMPADUR 4515-1987 | | *************************************** |
| MANUFACTURER | HEMPEL | | |
| VOLUME % SOLIDS | 82% | | *************************************** |
| 20% | 1.5 LB/GAL (180 G/L) | *************************************** | *************************************** |
| POT LIFE | 3 HOURS @ 68F | *************************************** | *************************************** |
| INDUCTION TIME | NONE | | |
| DRYING TIME MINIMUM | RECOAT 8 HOURS @ 68F / FULL | @ 68F / FULL CURE 7 DAYS @ 68F | *************************************** |
| RECOMMENDED FILM THICKNESS | MILS PER COAT : DRY 8 / WET 10 | *************************************** | |
| MIXING RATIOS | 1 PART A:1 PART B BY VOLUME | *************************************** | |
| | #0846 THINNER @ 5% MAXIMUM | | |
| | 1st COAT | Znd COAT | |
| APPLICATION DATA | MOOO @ 2000 M | 3/13/93 @ 8:00 A.M. | |
| DATE/TIME | 3/12/93 @ 3:00 r.iW. | 2007 | |
| ЯН | 22% | A 50 | |
| TEMPERATURE | 70f | | F |
| SUBSTRATE CONDITION | SSPC VIS 1-C @ 2.0 MILS PROFILE | HEMPADUR 4515/138/ [131 COA1] | |
| COATING BATCH NUMBERS | A: UH2820323 / B: UH1030166 | A: UH2820323 / B: UH1030189 | |
| THINNING | #0846 @ 5% | #0846 @ 5% | |
| EQUIPMENT | DEVILBISS MBC 704E | DEVILBISS MBC 7045 | 0 |
| NUMBER OF COATS | | 1 | |
| SAG INDEX | 14 MILS | 14 MILS | |
| | | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT | TOTAL |
| SAMPLE 72 | 8 | | 1/ |
| SAMPLE 73 | 7.5 | | 17.9 |
| SAMPLE 74 | 8 | | 16.3 |
| SAMPLE 75 | | 7.5 | 16 |
| SAMPLE 76 | 8.5 | | 17 |
| SAMPLE 77 | 8 | | |

| ALUMINUMEEDXY MASTIC PROGRAM DATE: 4/5/39 EVALUATION HOURS: 336 COATING EVALUATION DATA TEST PANEL NUMBER ASTM D714 DEGREE OF BLISTERING, SIZE O CORESING EVALUATION OF PAINTED ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D714 DEGREE OF BLISTERING, FREQUENCY O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O O | PANEL EVALUATION | | | HEMP | HEMPADUR 4515/1987 | 515/198 | 37 |
|--|--|----|-----|-----------|---------------------------|---------|---|
| 72 73 74 75 76 76 76 76 76 76 76 7 | CLIENT: U.S. Army Corp of Eng. | | | | | | |
| T2 T3 T4 T5 T6 T6 T7 | ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/5/93 | | | | | | |
| 72 73 74 75 76 76 76 76 76 76 76 7 | HOURS: 336 | | | | | | |
| ADE ADE O O O O O O O O O O O O O | COATING EVALUATION DATA | | | | | | COMMENTS |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 10 10 10 10 10 | TEST PANEL NUMBER | 72 | 73 | 74 | 75 | 76 | 77 |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ASTM D714 DEGREE OF RISTERING SIZE | 0 | C | C | C | C | changes on any panels O in this set after 336 hours |
| O O O O O O O O O O O O O O O O O O O | | | | | | | of exposure. |
| | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| FINAL EVALUATION ONLY | ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| FINAL EVALUATION ONLY | OR COATED SPECIMENS SUBJECTED | | | | | | |
| FROM SCRIBE, FINAL EVALUATION ONLY FROM SCRIBE, FINAL EVALUATION ONLY I NUMBER FINAL EVALUATION ONLY ISHIBED AREAS, 0 0 0 0 0 ED 0 | TO CORROSIVE ENVIRONMENTS | | | | | | _ |
| FROM SCRIBE, INUMBER SIRIBED AREAS, SIRIBED AREAS, SIRIBED AREAS | MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| EAS, | TABLE 1, INCHES | | FIN | IL EVALUA | TION ONLY | | |
| EAS, CARRED AREAS FINAL EVALUATION ONLY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | TABLE 1, RATING NUMBER | | FIN | | TION ONLY | , | |
| 3ED AREAS 10 10 10 10 | RATING OF UNSCRIBED AREAS. | | | | | | |
| 10 10 10 10 | TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | | |

| PANEL EVALUATION | | | HEN | HEMPADUR 4515/1987 | 4515/ | 1987 |
|--|----|-------|-------------|--------------------|-------------|---|
| CLENT: U.S. Army Corp of Eng. | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/19/93 | | | | | | |
| EVALUATION HOURS: 672 | | | | | | |
| COATING EVALUATION DATA | | _ | | _ | | COMMENTS |
| TEST PANEL NUMBER | 72 | 73 | 74 | 75 | 76 | 77 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible |
| ASTA DA14 DECREE OF RESTERING SIZE | 0 | 0 | 0 | 0 | 0 | changes on any panels 0 in this set after 672 hours |
| AS IM D/ 14 DEGREE OF BEISTENING, SIZE | | | | | , | of exposure |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | - | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBSECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE. | | | | | | |
| TABLE 1, INCHES | | FINAL | !! | EVALUATION ONLY | <u>></u> | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| TABLE 1, RATING NUMBER | | E _ | FINAL EVALL | EVALUATION ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 01 |

| PANEL EVALUATION | | | HEMF | ADUR | HEMPADUR 4515/1987 | 987 | |
|--|----|----|-----------|-----------------|--------------------|-----|--|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 5/17/93 | | | | | | | |
| EVALUATION HOURS: 1344 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 72 | 73 | 74 | 75 | 76 | 77 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | changes on any panels of in this set after 1344 hours |
| | | | | | | | of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVA | EVALUATION ONLY | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PAINEL EVALUATION | | | | | | | 100 |
|---|-----|-------|---------------|-----------------|----------|----------|--|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | | |
| COATING EVALUATION DATA | _ | | _ | | | COMMENTS | Τ |
| TEST PANEL NUMBER | 72 | 73 | 74 | 75 | 76 | 77 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 2 | 0 | 0 | 0 | 0 | |
| ACTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | Few | 0 | 0 | 0 | 0 | 10 00 00 00 00 00 00 00 00 00 00 00 00 0 |
| ACTION OF BAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | | EVALUATION ONLY | | | |
| MEAN CREEPAGE FROM SCRIBE, | | FINAL | AL EVALUATION | ATION ONL | \ | | |
| TABLE 1, KALING NOWBER | | | | | | | |
| RATING OF UNSCRIBED AREAS, | | • | C | c | C | 0 | |
| TABLE 2, % FAILED | 0 | 0 | > | P | > | | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 10 | 10 | 10 | 10 | 10 | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 |

| PANEL EVALUATION | | | HEMP | ADUR | HEMPADUR 4515/1987 | 1987 | |
|--|----|-----|-----------------------|-----------------|--------------------|------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 7/12/93 | | | | | | | |
| EVALUATION HOURS: 2688 COATING EVALUATION DATA | | | _ | | • | | COMMENTS |
| TEST PANEL NUMBER | 72 | 73 | 74 | 75 | 76 | 77 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 2 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | Faw | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVALL | EVALUATION ONLY | JNLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVALUATION ONLY | UATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 8/9/93 EVALUATION HOURS: 3360 | | | | | | | |
|--|----------|-------|------------|-----------------|------|----------|---------------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 8/9/93 EVALUATION HOURS: 3360 | | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM DATE: 8/9/93 EVALUATION HOURS: 3360 | | | | | | | |
| DATE: 8/9/93 EVALUATION HOURS: 3360 | , | | | | | | |
| EVALUATION HOURS: 3360 | , | | | | | | |
| | | | | | | | |
| COATING EVALUATION DATA | | _ | | | | <u> </u> | COMMENTS |
| | S | 13 | 77 | 75 | 76 | 77 | |
| TEST PANEL NUMBER | 7/ | 2 | , | 2 | 2 | | Blistering has occurred |
| ACTM DE10 BIIST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | O only at the edge of the |
| ASIM DOLO TOTAL | | | | | | | scribe. |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 2 | 9 | 9 | 4 | 9 | |
| | | | L | | 1 | 100 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Føw | - Med | ₩ 0 | Med. | A P | Š P | |
| ACTA PACEA EVALUATION OF BAINTED | · - | | | | | | |
| AS IN DIEST EVALUATION OF TAINING | <u> </u> | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| ALTAN OPERDACE EDOM CODIDE | | | | | | | |
| TABLE 1 INCHES | | I | FINAL EVAL | EVALUATION ONLY | NLY | | |
| ABLE 1, INCILLO | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | - | FINAL EVA | EVALUATION ONLY | ONLY | | |
| DATES OF TRICODIDED ADEAS | | | | | | | |
| HADITA OF UNACKIBED ANEAS, | 0 | 0 | 0 | 0 | 0 | 0 | |
| I ABLE 2, 70 FAILED | | | | | | | |
| TARIF 2 RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |
| | | | | | | | |

| PANEL EVALUATION | | | | HEINIFADOR | 4010/1004 | 100 | |
|--|-------|-------|------|------------|-----------|---------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 9/6/93 EVALUATION HOURS: 4032-Final | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 72 | 73 | 74 | 75 | 76 | 77 | |
| ASTM DRIOT GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Blistering has occurred O only along the scribe |
| ANTIN DOTO TOOL OTHER ANTINCTOR OFF | | | V | | 6 | 6 | edges. |
| AS I'M D7 14 DEGREE OF BLISTERING, SIZE | 7 | 7 | | | 7 | 1 | |
| ASIM D/14 DEGREE OF BLISTERING, FREQUENCY | Lea | Dense | Med | . Ned. | D 960 | Med-bem | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | 1,10 | 1 10" | 1111 | 10/1 | 1 /0" | 19/1 | |
| ABLE 1, INCHES | 2 | 2 | 2 | 2 | | | Loss of adhesion and |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | underfilm rusting has |
| TABLE 1, RATING NUMBER | 7 | 9 | 9 | 9 | ហ | 9 | occurred only under blisters. |
| RATING OF UNSCRIBED AREAS, TARIF 2 % FAILED | | 0 | 0 | 0 | 0 | 0 | |
| TABLE & DATING # OF INICODIDED ABEAS | 1 5 | 10 | 9 | 1 | 01 | 0, | |
| TABLE 4, NATING # OF ONSCRIBED AREAS | 2 | 2 | 2 | | | 2 | |

| US ARMY CORP OF ENGINEERS | ALUMINU | ALUMINUM EPOXY MASTIC PROGRAM | 5 |
|----------------------------|---------------------------------------|---|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | INTERGARD UNIVERSAL ALUMINUM | <u>M</u> | *************************************** |
| MANUFACTURER | PORTER INTERNATIONAL | *************************************** | |
| VOLUME % SOLIDS | 80% +/- 2% | | *************************************** |
| NOC | | | |
| POT LIFE | | | *************************************** |
| INDUCTION TIME | 15 MINS @ 75F | | *************************************** |
| DRYING TIME MINIMUM | RECOAT 6 HOURS @ 75F / FULL CURE NOT | URE NOT STATED | *************************************** |
| RECOMMENDED FILM THICKNESS | MILS PER COAT: DRY 4-8 / WET 6.3-10.0 | 3.3-10.0 | *************************************** |
| MIXING RATIOS | 1 PART A: 1 PART B BY VOLUME | | *************************************** |
| THINNING | #T-5 THINNER @ 12% MAXIMUM | | |
| APPLICATION DATA | l 1st COAT | 2nd COAT | |
| DATE/TIME | 3/10/93 @ 4:00 P.M. | N/A | |
| H | 63% | N/A | |
| TEMPERATURE | | N/A | |
| SUBSTRATE CONDITION | SSPC VIS 1-C @ 2.2 MILS PROFILE | N/A | |
| COATING BATCH NUMBERS | A: UHA 10055B / B: UHN 12602M | N/A | |
| DNINNIHL | #T-5 @ 12% | N/A | |
| EQUIPMENT | DEVILBISS MBC 704E | N/A | |
| NUMBER OF COATS | | N/A | |
| SAG INDEX | >24 MILS / 7 MILS THINNED 12% | N/A | |
| | | | 14707 |
| DRY FILM THICKNESS, MILS | 1st COAT | _, | IOIAL |
| SAMPLE 49 | 7.3 | - | 7.3 |
| SAMPLE 50 | 6.9 | N/A | 6.0 |
| SAMPLE 51 | 7.8 | N/A | 7.8 |
| SAMPLE 52 | 6.7 | | 6.7 |
| SAMPLE 53 | 7.1 | | |
| SAMPLE 54 | 8 | N/A | 20 |

| PANEL EVALUATION | | Z | TERGAR | D UNIVE | RSAL / | INTERGARD UNIVERSAL ALUMINUM |
|--|----|-------|-------------------|-----------------|--------|--------------------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/5/93 | | | | | | |
| COATING EVALUATION DATA | | _ | | | _ | COMMENTS |
| TEST PANEL NUMBER | 49 | 20 | 51 | 52 | 53 | 54 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible effects |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | O after 336 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | _ | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | L EVALUATION ONLY | ION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | EVALUATION ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |

| PANEL EVALUATION | | | NTERG/ | ARD UN | IVERS | INTERGARD UNIVERSAL ALUMINUM | AINUM |
|--|----|-------|------------|-----------------------|-------|------------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | ļ | | | | | | |
| DATE: 4/19/93 EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | _ | _ | _ | | | COMMENTS |
| TEST PANEL NUMBER | 49 | 20 | 51 | 52 | 53 | 24 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | - E | JAL EVALU | FINAL EVALUATION ONLY | > | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVAL | EVALUATION ONL' | LY. | | |
| RATING OF UNSCRIBED AREAS, | | | | d | 0 | /10/ | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 5 |) | 2 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | <u>o</u> | |
| | | | | | | | |

| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 5/17/93 EVALUATION HOURS: 1344 | The second secon | | | | - | | |
|---|--|-------|--|-----------------|--|-------|----------|
| DATE: 5/17/93 EVALUATION HOURS: 1344 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| | | | | | | | • |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 49 | 20 | 15 | 52 | 53 | 54 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | 1 | Total and the second se | | Course Course | | |
| MEAN CREEPAGE FROM SCRIBE, | | | - 11 | | | | |
| TABLE 1, INCHES | | FINAL | . 11 | EVALUATION ONLY | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | FINAL | l «II | EVALUATION ONLY | <u></u> | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 6 | |

| PANEL EVALUATION | | | INTERGARD UNIVERSAL ALUMINUM | RD UNI | VERS/ | AL ALUR | MINUM |
|--|----|----|------------------------------|-----------------|-------|---------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM |] | | | | | | |
| DATE: 6/14/93 EVALUATION HOURS: 2016 | | | | | | | COMMENTS |
| COATING EVALUATION DATA | | | | | | | |
| TEST PANEL NUMBER | 49 | 20 | 12 | 52 | 23 | 54 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0.03% | 0 | 0 | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | _ | | | _ | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVALUATION ONLY | ATION ON | - | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVALL | EVALUATION ONLY | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | <1% | 0 | 0 | ×1× | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 6 | 10 | 10 | 6 | |
| | | | | | | | |

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| PANEL EVALUATION | | | INTERG/ | ARD UNIV | /ERS/ | INTERGARD UNIVERSAL ALUMINUM | |
|---|----|----|-------------|-----------------|-------|------------------------------|--|
| CLIENT: U.S. Army Corp of Eng. | 1 | | | | | | |
| DATE 712/93 | | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS | |
| TEST PANEL NUMBER | 49 | 20 | 51 | 52 | 53 | 54 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0.03% | 0 | 0 | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | _ | | | | | | |
| OR COATED SPECIMENS SUBJECTED | 1 | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVALU | EVALUATION ONLY | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | + | | |
| TABLE 1, RATING NUMBER | | 4 | FINAL EVALU | EVALUATION ONLY | | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | <1% | 0 | 0 | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 6 | 10 | 10 | 6 | |

| PANEL EVALUATION | | | INTERG | ARD UI | NIVERS | AL AL | INTERGARD UNIVERSAL ALUMINUM |
|--|-------|---------|------------|-----------------|---------------|-------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 8/9/93 EVALUATION HOURS: 3360 | | Asset S | | | | | SINWINI |
| COATING EVALUATION DATA TEST PANEL NUMBER | 49 | 20 | 51 | 52 | 53 | 54 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0.03% | 0.03% | 0 | 0.03% | 0.03% Blistering has occurred only at the edge of the |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 8 | ω | ω | 8 | 8 | scribe. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Few | Few | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION O | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION ONLY | NLY SNLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | <1% | <1% | 0 | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 6 | 6 | 10 | 6 | |

| PANEL EVALUATION | | | INTER | GARD | UNIVER | SAL AL | INTERGARD UNIVERSAL ALUMINUM |
|---|-------|---------|-------|---------|--------|---------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | 1 1 | | | | | | |
| DATE: 9/13/93 EVALUATION HOURS: 4032-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 49 | 20 | 51 | 52 | 53 | 54 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0.03% | 0.03% | 0 | \perp | 0.03% Blistering has occurred only |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 4 | 8 | 9 | 80 | 80 | along the scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Med | Med/Den | Few | Med/Den | Med | Med | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | 1/64" | 1/16" | 1/32" | >1/16" | 1/64" | 1/64" | Loss of adhesion and |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | undernim rust creepage from the scribe has |
| TABLE 1, RATING NUMBER | 6. | 7 | 8 | 9 | 6 | | 9 occurred only under |
| DATING OF INSCRIBED ABEAS | | | | | | | blisters. |
| TABLE 2, % FAILED | <1% | 0 | <1% | <1% | 0 | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 6 | 6 | 10 | 10 | |

| COATING SYSTEM DATA | | |
|----------------------------|--|---|
| COATING ID | MAGNA MASTIC 7900 | *************************************** |
| MANITERCTURER | PORTER INTERNATIONAL | |
| VOLUME % SOLIDS | 84% + /- 2% | *************************************** |
| | | |
| POT LIFE | 4 HOURS @ 75F | *************************************** |
| INDICATION TIME | 15 MINS @ 75F | |
| DRYING TIME MINIMUM | RECOAT 24 HOURS @ 75F / FULL CURE NOT STATED | RE NOT STATED |
| RECOMMENDED FILM THICKNESS | MILS PER COAT: DRY 5 / WET 6 | *************************************** |
| MIXING RATIOS | 1 PART A: 1 PART B BY VOLUME | *************************************** |
| THINNING | #T-5 THINNER @ 12% MAXIMUM | |
| | 1st COAT | 2nd COAT |
| APPLICATION DATA | Macon & corons | NA |
| DATE/TIME | 3/10/93 @ 3:00 P.M. | M/A |
| HZ. | | WAY A |
| TEMPERATURE | 72F | N/A |
| SUBSTRATE CONDITION | SSPC VIS 1.C @ 2.3 MILS PROFILE | N/A |
| COATING BATCH NUMBERS | A: 2213639 / B: 2213681 | N/A |
| THINNING | T-5 @ 12% | IN/A |
| EQUIPMENT | DEVILBISS MBC 704E | N/A |
| NUMBER OF COATS | | N/A |
| SAG INDEX | 15 MILS THINNED 12% | N/A |
| | | |
| DRY FILM THICKNESS, MILS | 7 | JAT |
| SAMPLE 43 | | N/A 5.7 |
| SAMPLE 44 | 1 | |
| SAMPLE 45 | 4.5 | |
| SAMPLE 46 | * | N/A 4.8 |
| SAMPLE 47 | | M/A 4.4 |
| SAMPLE 48 | 4.4 | |

| PANEL EVALUATION | | | | MAGN. | MAGNA MASTIC 7900 | FIC 790 | 0 |
|---|-----|-----|-----------------------|-----------------|-------------------|---------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM |] | | | | | | |
| DATE: 4/5/93 | | | | | | | |
| EVALUATION HOURS: 336 | | | | | | | |
| COATING EVALUATION DATA | - | | | | | | COMMENTS |
| TEST PANEL NUMBER | 43 | 44 | 45 | 46 | 47 | 48 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | O There are no visible effects |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | on any panels in this set after 336 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | E - | FINAL EVALUATION ONLY | ATION OF | ıry | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | ! | | | |
| TABLE 1, RATING NUMBER | | H | FINAL EVALU | EVALUATION ONLY | NLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | 2 | ANBA | MAGNA MASTIC 7900 | 2 7900 | |
|--|-------|-------|------------|-----------------|-------------------|--------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/19/93 EVALUATION HOURS: 672 |] | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 43 | 44 | 45 | 46 | 47 | 48 | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.10% | 0.03% | 0.03% | 0.30% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONL' | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | FINAL EVA | EVALUATION | ON ONLY | | |
| ABLE 1, RATING NUMBER | | | . II | | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | 6 | 6 | |
| | | | | | | | |

| PANEL EVALUATION | | | | MAGN | MAGNA MASTIC 7900 | TIC 790 | 00 |
|---|-------|-------|-----------------------|------------|-------------------|---------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 5/17/93 EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 43 | 44 | 45 | 46 | 47 | 48 | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.10% | 0.03% | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | since previous (672 hours) evaluation. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROCKIVE ENVIRONMENTS | | | | | | | |
| MEAN OBSERVE SOM SOSIES | | | | | | | |
| MEAN CREETAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVALUATION ONLY | UATION | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | 6 | 6 | |

| CLERT. U.S. ARITIC CORP of Eng. COMMENTS | PANEL EVALUATION | | | | MAGNA | MASTI | MAGNA MASTIC 7900 | |
|--|--|-------|-------|----------|-----------|-------------|-------------------|----------|
| 117E 11TE | CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| NO # OF DAINTED AREAS 10% | ALUMINUM/EPOAT MAS IIC PROGRAM DATE: 6/14/93 | | | | | | | |
| 43 44 45 46 47 48 | EVALUATION HOURS: 2016 | | | | | | | |
| ADE O.10% 3.00% 10% 10% 5% 20% OF BLISTERING, SIZE OF BLISTERING, SIZE OF BLISTERING, FREQUENCY OF BLISTERING, FREGUENCY OF BLISTERING, FREQUENCY OF BLISTERING, FREGUENCY OF BLISTERING, FREGUE | COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| NUENCY 0.10% 3.00% 10% 10% 5% 20% 20% 20% 20% 20% 20% 20% 20% 20% 20 | TEST PANEL NUMBER | 43 | 44 | 45 | 46 | 47 | 48 | |
| DUENCY 0 0 0 0 Few | ASTM D610 RUST GRADE | 0.10% | 3.00% | 10% | 10% | 2% | 20% | |
| FREQUENCY | ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 8 | 0 | 8 | |
| FINAL EVALUATION ONLY FINA | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 Fe | Me | 0 Fe | We | |
| FINAL EVALUATION ONLY FINA | ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| FROM SCRIBE, FROM SCRIBE, I NUMBER STRIBED AREAS, ED # OF UNSCRIBED AREAS # OF UNSCRIBED AREAS FINAL EVALUATION ONLY | TO CORROSIVE ENVIRONMENTS | | - | | | | | |
| EAS, CRIBED AREAS 9 8 6 6 7 | MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | 1 11 11 | JATION ON | <u>></u> | | |
| C C C C C C C C C C | MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | 1 11 .11 | UATION O | NLY | | |
| 2 8 6 2 | RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 3% | 10% | 10% | 2% | 20% | |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 8 | 9 | 9 | 7 | ß | |

| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 7/12/93 EVALUATION HOURS: 2688 COATING EVALUATION DATA TEST PANEL NUMBER ASTM D610 RUST GRADE 10% 16% | | | | | |
|---|-----------------------|--------------|------|--|---|
| NGRAM 43 43 43 10% | -7. | | | がは、これはいけいけいかいかいかいかいないないないないないないないないないないないないないな | |
| OURS: 2688 UATION DATA IMBER ST GRADE | | | | | |
| UATION DATA IMBER ST GRADE 10% | | | | | |
| N DATA 43 ADE 10% | | | | | |
| ADE 10% | | | | | COMMENTS |
| 10% | 45 | 46 | 47 | 48 | |
| | 20% | 20% | 10% | 20% | |
| | α | 8 | 0 | 8 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY 0 Few | Few | Med | 0 | Med | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | FINAL EVALUATION ONLY | UATION OF | ALY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | FINAL EVAL | EVALUATION O | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED 16% | 20% | 20% | 10% | 20% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS 6 5 | 2 | 2 | 9 | 2 | 000000000000000000000000000000000000000 |

| CLIENT: U.S. Army Cop of Eng. ALUMINUMEPOXY MASTIC PROGRAM DATE: 8/9/93 EVALUATION HOURS: 3360 COATING EVALUATION DATA ASTEM DELA DEGREE OF BLISTERING, SIZE ASTM D714 DEGREE OF BLISTERING, SIZE ASTM D714 DEGREE OF BLISTERING, FREQUENCY TABLE 1, INCHES MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING OF UNSCRIBED AREAS, TABLE 2, RATING 90 UNSCRIBED AREAS, TABLE 2, RATING # OF UNSCRIBED AREAS 9 3 0 0 0 5 0 0 | PANEL EVALUATION | | | Σ | AGNA P | MAGNA MASTIC 7900 | 7900 | |
|---|--|------------|------|--------|---------|-------------------|-------|----------|
| 43 44 45 46 47 48 48 49 40% 90% 16% 95% 46 47 48 48 49 40% 90% 90% 16% 95% 49 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 16% 95% 40% 90% 90% 16% 95% 40% 90% 90% 16% 95% 40% 90% 90% 16% 95% 40% 90% 90% 16% 95% 40% 90% 90% 16% 95% 40% 90% 90% 16% 90% | CLIENT: U.S. Army Corp of Eng. At UMINIUM/EPOXY MASTIC PROGRAM | J | | | | | | |
| 43 44 45 46 47 48 48 40 40 40 40 40 40 | DATE: 8/9/93 | | | | | | | |
| ADE ADE ADE 10% 40% 90% 16% 95% TOWNIENTS MASCRIBE, MACHIBED AREAS, 10% 40% 90% 16% 95% TOWNIENTS AND OF PAINTED AND SCRIBE, Few Med Med Dense Few Dense Rew Med Med Dense Few Dense AND SCRIBE, Few Med Med Dense Few Dense B 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 | | | | | | | | |
| ADE ADE 10% 40% 90% 90% 16% 16% 16% 15 | COATING EVALUATION DATA | | | | | | | COMMENTS |
| 10% 40% 90% 16% | TEST PANEL NUMBER | 43 | 44 | 45 | 46 | 47 | 48 | |
| NUENCY Few Med Med Dense Few D Few Med Med Dense Few D Final EVALUATION ONLY FINAL FINAL EVALUATION ONLY FINAL FINAL EVALUATION ONLY FINAL | ASTM D610 RUST GRADE | 10% | 40% | %06 | %06 | 16% | %56 | |
| Few Med Med Dense Few Dense Dense Few Dense Few Dense Few Dense Few Dense Dense Few Dense De | ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 8 | æ | ∞ | 8 | 8 | |
| FINAL EVALUATION ONLY FINA | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Med | Med | Dense | Few | Dense | |
| FINAL EVALUATION ONLY FINA | ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| FINAL EVALUATION ONLY FINA | OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| FINAL EVALUATION ONLY | MEAN CREEPAGE FROM SCRIBE, | | | 11 11 | LUATION | JNLY | | |
| FINAL EVALUATION ONLY 10% 40% 90% 90% 16% | MATAN OPERACE FROM SCRIPE | | | | | | | |
| BED AREAS, 10% 40% 90% 16% OF UNSCRIBED AREAS 9 3 0 0 5 | MEAN CREEFAGE FROM SCHIDE, TABLE 1, RATING NUMBER | | | 11 .11 | | ONLY | | |
| OF UNSCRIBED AREAS 9 3 0 0 5 | RATING OF UNSCRIBED AREAS, | 10%/ | 400% | | | 16% | 95% | |
| 9 3 0 0 2 | TABLE 2, % FAILED | % <u>2</u> | 0,01 | | | 2 | | |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 3 | 0 | | വ | 0 | |
| | | | | | | | | |

| PANEL EVALUATION | | | M | MAGNA MASTIC 7900 | IASTIC | 7900 | |
|--|-------|-------|-------|-------------------|--------|-------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | , | | | | | | |
| DATE: 9/13/93 EVALUATION HOURS: 4032-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 43 | 44 | 45 | 46 | 47 | 48 | |
| ASTM D610 RUST GRADE | 10% | %09 | %06 | %06 | 32% | 95% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | ω | ω | 9 | ω | 80 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Med. | Dense | Dense | Dense | Few | Dense | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| ON CORROSIVE ENVIRONMENTS | | | | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/64" | 1/64" | 1/64" | 1/64" | 1/64" | 1/64" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 6 | 6 | 6 | o o | o | 6 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 10% | %09 | %06 | %06 | 32% | %56 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 9 | - | 0 | 0 | 3 | 0 | |
| | | | | | | | |

| IIS ARMY CORP OF ENGINEERS | ALUMINUI | ALUMINUM EPOXY MASTIC PROGRAM |
|----------------------------|--|---|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | EPOXY MASTIC ALUMINUM II | *************************************** |
| MANUFACTURER | SHERWIN-WILLIAMS | *************************************** |
| VOLUME % SOLIDS | 80% + /- 2% | |
| 202 | 1,43 LB/GAL (173 G/L) | *************************************** |
| POT LIFE | 3 HOURS @ 77F | |
| INDUCTION TIME | 15 MIN @ 77F | |
| DRYING TIME MINIMUM | RECOAT 18 HOURS @ 77F / FULL CURE 10 DAYS @ 77 | URE 10 DAYS @ 77F |
| RECOMMENDED FILM THICKNESS | MILS PER COAT: DRY 4-6 / WET 5-7.5 | 7.5 |
| MIXING RATIOS | 1 PART A: 1 PART B BY VOLUME | |
| NINIHL | R2K4 XYLENE @ 10% MAXIMUM | |
| | | |
| APPLICATION DATA | 1st COAT | Znd COAT |
| DATE/TIME | 3/2/93 @ 8:00 A.M. | 3/3/93 @ 3:00 P.M. |
| RH | 63% | %09 |
| TEMPERATURE | 73F | 73F |
| SUBSTRATE CONDITION | SSPC VIS 1-C @ 2.0 MILS PROFILE | EPOXY MASTIC ALUMINUM II |
| COATING BATCH NUMBERS | PART A T0692 / PART B T0992 | A: T0692 B: T0992 |
| HINNING | R2K4 XYLENE @ 10% | R2K4 XYLENE @ 10% |
| EQUIPMENT | DEVILBISS MCB 704E | DEVILBISS MCB 704e |
| NUMBER OF COATS | 1 | |
| SAG INDEX | 14 MILS / 7 MILS THINNED | 7 MILS THINNED 10% |
| | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT TOTAL |
| SAMPLE 1 | 9.9 | |
| SAMPLE 2 | 6.7 | |
| SAMPLE 3 | 6.8 | |
| SAMPLE 4 | 6.8 | |
| SAMPLE 5 | 6.7 | |
| SAMPLE 6 | 7.2 | 4.9 |

AL1-6.XLS

| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/5/93 EVALUATION HOURS: 336 COATING EVALUATION DATA TEST PANIEL MILIMBER | | | No. | | |
|--|----|----------|-----------------|--------|--------------------------------|
| ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/5/93 EVALUATION HOURS: 336 COATING EVALUATION DATA TEST PANEL MIMMER | | | | | |
| DATE: 4/5/93 EVALUATION HOURS: 336 COATING EVALUATION DATA TEST PANEL MILMRER | | | | | |
| EVALUATION HOURS: 336 COATING EVALUATION DATA TEST DAME MIMBER | | | | | |
| COATING EVALUATION DATA | | | | | |
| TEST DANIEL MILMARER | | | | | COMMENTS |
| LEGI - CHIEF MONIDEN | - | 2 3 | 3 4 | 22 | 6 There is no visible effect |
| | - | | | | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | O on any or the panels in this |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 |
| | | | | | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | |
| TO CORROSIVE ENVIRONMENTS | _ | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | |
| TABLE 1, INCHES | | FINAL EV | EVALUATION ONLY | ONLY | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | |
| TABLE 1, RATING NUMBER | | FINAL EV | EVALUATION ONL | N ONLY | |
| RATING OF UNSCRIBED AREAS, | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 10 | 0 10 | 10 | 10 |

| PANEL EVALUATION | | EP | OXY N | EPOXY MASTIC ALUMINUM II | ALUM | INOM II | |
|--|-------|-------|---------|--------------------------|---------------------------------------|---------|----------|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| DATE: 4/13/33 EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | _ | _ | _ | | 8 | COMMENTS |
| TEST PANEL NUMBER | - | 2 | m | 4 | ro | 9 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0.03% 0 | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | EVALU/ | EVALUATION ONL' | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | 1 11 11 | EVALUATION ONL' | - - - - - - - - - - - - - | | |
| RATING OF UNSCRIBED AREAS, | <1% | 0 | 0 | <1% <1% | | <1% | |
| יחטרר בין זיין רויבים | | | C | σ | σ | σ | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 8 | 2 | 2 | 5 | 5 | | |

| PANEL EVALUATION | | EP | OXY M | ASTIC | ALUN | EPOXY MASTIC ALUMINUM II | |
|---|-------|-------|----------------------|----------|------------|--------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| DATE: 5/17/93 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | <u> </u> | COMMENTS |
| TEST PANEL NUMBER | - | 2 | 6 | 4 | D | 9 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0.03% | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | 4 | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | _ | - | | _ | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | FINAL | FINAL EVALUATION ONL | TION ONI | > <u> </u> | | - |
| MEAN CREEPAGE FROM SCRIBE, | | | 1 11 | | | | |
| TABLE 1, RATING NUMBER | | FINAL | L EVALUATION | TION ONE | - - | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | <1% | 0 | 0 | <1% | × 1 × | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 6 | 6 | 6 | |
| | | | | | | | |

| DANEI EVALITATION | | | EPOXY | MAST | C ALUN | EPOXY MASTIC ALUMINUM II |
|---|-------|----------------------|------------|-----------------|--------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 6/14/93 EVALUATION HOURS: 2016 | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS |
| TEST PANEL NUMBER | - | 2 | 6 | 4 | ഹ | 9 |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0.03% | 0.03% | 0.03% There have been no noticable changes in |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | O any of these panels since the previous (1344 hour) |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED | 0 | 0 | 0 | 0 | 0 | 0 evaluation. |
| OR COALED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONL' | NLY | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | _ - - | FINAL EVA | EVALUATION | ONLY | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | <1% | <1% | <1% |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 5 | 10 | 10 | 6 | 6 | G. |

| PANEL EVALUATION | | | EPOX | MAST | IC ALUI | EPOXY MASTIC ALUMINUM II | |
|--|-------|-------|------------|-----------------|---------|--------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 7/12/93 | | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | | 2 | 8 | 4 | 2 | 9 | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | - | | | | | _ | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | FINAL EVAI | EVALUATION (| ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION ONLY | ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | 6 | 6 | |
| | | | | | | | |

| CLIENTLY U.S. Army Corp of Eng. COMMENTS | PANEL EVALUATION | | | EPOXY | MAST | EPOXY MASTIC ALUMINUM II | MINUM | = |
|--|--|--------|-------|-----------|---------|--------------------------|--------|-----------------------------|
| 1 2 3 4 5 1 2 3 4 5 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% 0.03% | -ĝu | , | | | | | | |
| 1 2 3 4 5 | ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| 1 2 3 4 5 | EVALUATION HOURS: 3360 | | | | | | | |
| ADE O.03% O | COATING EVALUATION DATA | | | | | | | COMMENTS |
| 0.03% | TEST PANEL NUMBER | - | 2 | 8 | 4 | 2 | 9 | |
| DUENCY O O O O O O O O O O O O O O O O O O O | ASTM D610 RUST GRADE | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | 0.03% | There are no visible |
| NUENCY O O O O O O O O O O O O O O O O O O O | ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | this set since the previous |
| EQUENCY Color Col | | | c | C | C | C | 0 | _ |
| FINAL EVALUATION ONLY | ASTM D714 DEGREE OF BEISTENING, FREGOLING | _) | | | | | | |
| FINAL EVALUATION ONLY FINA | ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| FINAL EVALUATION ONLY FINA | OR COATED SPECIMENS SUBJECTED | | | | | | | |
| FINAL EVALUATION ONLY FINA | TO CORROSIVE ENVIRONMENTS | | | | | | | |
| FINAL EVALUATION ONLY | MEAS CREEDAGE FROM SCRIBE | | | | | | | |
| FINAL EVALUATION ONLY | TABLE 1, INCHES | | | INAL EVAI | UATION | JNLY | | |
| FINAL EVALUATION ONLY | AND AND CONTRACT OF THE CONTRA | | | | | | | |
| EAS, | MEAN CREEFAGE FROM SCRIBE, | | | FINAL EVA | LUATION | ONLY | | |
| BED AREAS, <1% <1% <1% <1% OF UNSCRIBED AREAS 9 9 9 9 9 | | | | | | | | |
| CF UNSCRIBED AREAS < 1% | RATING OF UNSCRIBED AREAS, | | | | | 100 | /0 4 7 | |
| 6 6 | TABLE 2, % FAILED | <1% | <1% | <1% | <1% | % | × | |
| | TATEL TO DETAIL TO THE COLORS | σ | 6 | 6 | 6 | 0 | 6, | |
| | TABLE 2, RATING # OF UNSCRIBED ANEAS | 5 | | | | | | |
| | | | | | | | | |

| PANEL EVALUATION | | | EPOX | MAST | IC ALU | EPOXY MASTIC ALUMINUM II | |
|--|-------|--------|--------|--------|--------|--------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 9/13/93 EVALUATION HOURS: 4032-Final COATING EVALUATION DATA | | 1. jul | | tana F | | | COMMENTS |
| TEST PANEL NUMBER | - | 2 | 8 | 4 | D. | 9 | |
| ASTM D610 RUST GRADE | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAS CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/16" | 3/32" | >1/16" | <1/16" | >1/16" | >1/16" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 7 | 9 | ပ | 7 | ပ | 9 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | <1% | <1% | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 6 | 6 | 6 | 6 | |

| IIS ARMY CORP OF ENGINEERS | ALUMINUM | ALUMINUM EPOXY MASTIC PROGRAM | |
|----------------------------|---|--|---|
| | | | |
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | MACROPOXY ALUMINUM | *************************************** | |
| MANUEACTURER | SHERWIN-WILLIAMS (COOK) | | *************************************** |
| VOLUME % SOLIDS | %08 | *************************************** | *************************************** |
| | 1.5 LB/GAL (175 G/L) | | *************************************** |
| POT LIEF | . 40 MIN @ 75F | | *************************************** |
| INDITION TIME | 15 MIN @ 75F | | *************************************** |
| DRYING TIME MINIMUM | RECOAT 18-24 HOURS @ 75F / FULL CURE 7 DAYS @ 75F | . CURE 7 DAYS @ 75F | *************************************** |
| RECOMMENDED FILM THICKNESS | MILS PER COAT : DRY 6 / WET 7 | *************************************** | *************************************** |
| MIXING RATIOS | 1 PART A: 1 PART B BY VOLUME | | |
| NINNIHL | 250-C357 XYLENE (MAXIMUM NOT STATED) | STATED) | |
| | | TAOO Pag | |
| APPLICATION DATA | 1st COAT | ı | |
| DATE/TIME | 3/2/93 @ 1:00 P.M. | 3/3/93 21:00 P.M. | |
| Ha | 57% | %09 | |
| TEMPERATIRE | | 73F | |
| CHECTEATE CONDITION | SSPC VIS 1-C @ 2.4 MILS PROFILE | MACROPOXY ALUMINUM (1ST COAT) | |
| COATING RATCH NUMBERS | A; 38-1991010140-1017/B; 38-199120522164 | A: 38-1991010140-1017/8: 38-199120522164 | |
| CONTINUIT. | XYLENE @ 5% | XYLENE 5% | |
| PALINATION | BINKS | BINKS | |
| ECULINIEN | | - | |
| NUMBER OF COATS | | | |
| SAG INDEX | 9 MILS / 7 MILS THINNED 5% | / MILS I HINNED 5% | |
| | | | |
| DOVE IN TUICKNESS MIIS | 1st coAT | 2nd COAT To | TOTAL |
| DAT FILM THOMSES | 9 | 4.5 | 0.5 |
| SAMIPLE / | | 1.5 | 10.3 |
| SAMPLE 8 | 0,0 | | 9.2 |
| SAMPLE 9 | | | 0.5 |
| SAMPLE 10 | 6.2 | 601 | 10.9 |
| SAMPLE 11 | | | 10.7 |
| SAMPLE 12 | 7.3 | 3.4 | |

| ALUMINIUME COP OF ERG. COATING EVALUATION HOURS: 336 COATING EVALUATION DATA TEST PANEL NUMBER ASTM D014 DEGREE OF BLISTERING, SIZE O | PANEL EVALUATION | | | MA | CROPC | XY AL | MACROPOXY ALUMINUM |
|--|---|----|-------|----------|----------|-------|---|
| 7 8 9 10 11 12 12 12 12 12 12 12 | NT: U.S. Army Corp of Eng. | J | | | | | |
| HOURS: 336 | MINUM/EPOXY MASTIC PROGRAM | | | | | | |
| FRING, SIZE 0 0 0 0 0 0 0 FRING, SIZE 0 0 0 0 0 0 0 FRING, FREQUENCY 0 0 0 0 0 0 0 FRING, FREQUENCY 15 15 16 17 18 19 10 10 10 10 10 10 10 10 10 | E: 4/5/93 | | | | | | |
| ERING, SIZE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | LUATION HOURS: 336 | | | | | | |
| ADE ADE OF BLISTERING, SIZE OF CO OF OE OF OE OF OE OF OE OF OE OF OE | TING EVALUATION DATA | | _ | | | | COMMENTS |
| USTERING, SIZE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | T PANEL NUMBER | 7 | 8 | 6 | 10 | 1- | 12 |
| NUENCY O O O O O O O O O O O O O | M D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | |
| FREQUENCY O O O O O O O O O | M D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | on any panels in this set 0 after 336 hours of exposure. |
| FINAL EVALUATION ONLY | M D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| FINAL EVALUATION ONLY FINA | M D1654 EVALUATION OF PAINTED | | | | | | |
| FINAL EVALUATION ONLY | COATED SPECIMENS SUBJECTED CORROSIVE ENVIRONMENTS | | | | | | |
| FROM SCRIBE, FINAL EVALUATION ONLY FROM SCRIBE, FINAL EVALUATION ONLY NUMBER 60 0 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<> | | | | | | | |
| FINAL EVALUATION ONLY | AN CREEPAGE FROM SCRIBE, ILE 1, INCHES | | FINAL | EVALUATI | ON ONLY | - | |
| FINAL EVALUATION ONLY | AN CREEPAGE FROM SCRIRE | | | | | | |
| DED AREAS 10 10 10 10 10 | SLE 1, RATING NUMBER | | FINAL | EVALUAT | ION ONLY | | |
| 0 0 0 0 0 BED AREAS 10 10 10 10 | TING OF UNSCRIBED AREAS. | | | | | | |
| | 3LE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| | 3LE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

| CLEENT: U.S. ALINY CORP of Eng. CLEENT: U.S. ALINE OF UNSCRIBED AREAS. CLEENT: U.S. ALINE OF U.S | PANEL EVALUATION | | | 2 | MACROP | OXY A | MACROPOXY ALUMINUM |
|--|---|----|------|-----------|-----------|-------|-----------------------|
| 7 8 9 10 11 12 12 12 12 13 13 13 1 | |) | | | | | |
| 7 8 9 10 11 12 | CLIENT: U.S. Army Corp of Eng. | | | | | | |
| Total | ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | |
| DATA | DATE: 4/19/93 | | | | | | |
| FERING, SIZE O O O O O O O O O O O O O | 672 | | | | | | |
| FRING, SIZE 0 0 0 0 0 0 0 0 FERING, SIZE 0 0 0 0 0 0 0 0 FAMILE OF THE OLIVATION ONLY FINAL EVALUATION ONLY SE, FINAL EVALUATION ONLY SS, 0 0 0 0 0 0 0 0 RIBED AREAS | | | | | | | COMMENTS |
| ADE OF BLISTERING, SIZE OF CO OF C | COATING EVALUATION DATA | | | | | | |
| ADE DF BLISTERING, SIZE DF BLISTERING, SIZE OF BLISTERING, OF BOLD OF CONTROL OF CONT | | | 00 | 6 | 10 | 1- | |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | LEST PANEL NUMBER | | 1 | | | | changes on any panels |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ACTIO DIST CBADE | 0 | 0 | 0 | 0 | 0 | |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | AS I'M DO I'D ROS I GRADE | | | | | | - |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| NCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | | | | | | |
| FINAL EVALUATION ONLY FINAL EVALUATION ONLY FINAL EVALUATION ONLY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| FINAL EVALUATION ONLY | | | | | | | |
| FINAL EVALUATION ONLY FINAL EVALUATION ONLY FINAL EVALUATION ONLY F | ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| FINAL EVALUATION ONLY FINA | OR COATED SPECIMENS SUBJECTED | | | | | | |
| FINAL EVALUATION ONLY FINA | TO CORROSIVE ENVIRONMENTS | | | | | | |
| FINAL EVALUATION ONLY FINA | SGIGO WOOD TO WALK | | | | | | |
| FROM SCRIBE, FINAL EVALUATION ONLY NUMBER FINAL EVALUATION ONLY RIBED AREAS, 0 0 0 0 0 0 ED 10 10 10 10 10 10 | TABLE 1. INCHES | | FINA | IL EVALUA | TION ONLY | | |
| FINAL EVALUATION ONLY | | | | | | | |
| SED AREAS FINAL EVALUATION ONLY 10 10 10 10 10 10 10 10 10 10 10 10 10 | MEAN CREEPAGE FROM SCRIBE, | | | - 11 | | | |
| 3ED AREAS 10 10 10 10 | TABLE 1, RATING NUMBER | | NE L | . 11 | ATION ONL | | |
| 3ED AREAS 10 10 10 10 10 | RATING OF LINSCRIBED AREAS. | | | | | | |
| 10 10 10 10 10 | TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 10 10 10 10 10 | | | | | | - | |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 2 | 0 | 10 | 2 | 01 |
| | | | | | | | |

| PANEL EVALUATION | | | | MACROPOXY ALUMINUM | KY ALU | MINUM |
|---|----|-------|---------------|--------------------|--------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | |
| DATE: 5/17/93 EVALUATION HOURS: 1344 | | | | | | |
| | | | | | | |
| COATING EVALUATION DATA | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 1 | - | 2 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible |
| ASTM D714 DEGREE OF BUSTERING. SIZE | 0 | 0 | 0 | 0 | 0 | changes only any panels 0 in this set after 1344 hours |
| | | | | | | of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | 6 | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| TABLE 1, INCHES | | FINAL | 1 .11 | EVALUATION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| TABLE 1, RATING NUMBER | | FINAL | AL EVALUATION | ATION ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |
| | | | | | | |

| PANEL EVALUATION | | | _ | MACROPOXY ALUMINUM | XY ALL | JIMINOM |
|---|----|----|-----------------------|--------------------|--------|---|
| C. IENT: U.S. Army Corp of Eng. |] | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | 1 | | | | | |
| DATE: 6/14/93 | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | |
| COATING EVALUATION DATA | | | _ | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 | 11 | 12 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible |
| ACTM DA14 DECDEE OF BLISTERING SIZE | 0 | 0 | 0 | 0 | 0 | changes on any panels in 0 this set after 2016 hours of |
| ASIM DV 14 DEGREE OF BESTERING, SIZE | | | | | | exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | <u> </u> | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | |
| TO CORROSIVE ENVIRONMENTS | - | | | | | |
| MEAN CREEPAGE FROM SCRIBE. | | | | | | |
| TABLE 1, INCHES | | H. | FINAL EVALUATION ONLY | VIION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| TABLE 1, RATING NUMBER | | 됩 | FINAL EVALUATION | ATION ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

| PANEL EVALUATION | | | | MACROF | OXY A | MACROPOXY ALUMINUM |
|---|----|-------|-------|-----------------|-------|--------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | et. |
| DATE: 7/12/93 | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | |
| COATING EVALUATION DATA | | | | _ | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 | 1- | 12 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | _ | | _ | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | 11 11 | EVALUATION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | EVALUATION ONLY | | |
| RATING OF UNSCRIBED AREAS, | | | | C | C | C |
| TABLE 2, % FAILED | 0 | 5 | 2 |) | > | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |

| PANEL EVALUATION | | | | MACRO | POXY / | MACROPOXY ALUMINUM |
|--|-----|-----|------------|-----------------------|--------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 8/9/93 | | | | | | |
| EVALUATION HOURS: 3360 COATING EVALUATION DATA | | | | | _ | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 | 11 | 12 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 4 | 4 | 4 | 9 | 6 All blistering is right at the edges of the scribe. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Med. | Med. | Few. | Few. |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | NAL EVAL | FINAL EVALUATION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVAL | EVALUATION ONLY | ILY | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 9/13/93 EVALUATION HOURS: 4032-FINAL | ļ | | | 10 10 10 10 10 10 10 10 10 10 10 10 10 1 | 1000000000000000000000000000000000000 | 1000 1000 1000 1000 1000 1000 1000 100 | |
|---|--------|---------|--------|--|---------------------------------------|---|-------------------------|
| DATE: 9/13/93 EVALUATION HOURS: 4032-FINAL | | | | | | | |
| EVALUATION HOURS: 4032-FINAL | | | | | | | |
| SONTING EVALUATION BATA | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 | 11 | 12 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Blistering has occurred |
| | | | | | | | - |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 2 | 2 | 4 | 9 | 4 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Med. | Med/Den | Dense | Med/Den | Med. | Med. | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | <1/16" | >3/16" | >3/16" | 1/8" | <1/16" | 1/8" | |
| | | | | | | | Loss of adhesion and |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | underfilm rust creepage |
| TABLE 1, RATING NUMBER | 7 | 4 | 4 | 9 | 7 | e | 6 along the scribe has |
| | | | | | | | occurred only under the |
| RATING OF UNSCRIBED AREAS, | | | | | | | blisters. |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2. RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| US ARMY CORP OF ENGINEERS | ALUMINU | ALUMINUM EPOXY MASTIC PROGRAM |
|----------------------------|--|---------------------------------------|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | SURFACE TOLERANT EPOXY COATING | LING |
| MANUFACTURER | SHERWIN-WILLIAMS | |
| VOLUME % SOLIDS | 80% +/- 2% | |
| VOC | 1.45 LB/GAS (174 G/L) | |
| POT LIFE | 4 HOUR @ 77F | |
| INDUCTION TIME | 15 MIN @ 77F | |
| DRYING TIME MINIMUM | RECOAT 18 HOURS @ 77f / FULL CURE 10 DAY @ 77F | CURE 10 DAY @ 77F |
| RECOMMENDED FILM THICKNESS | MILS PER COAT : DRY 6 / WET 7 | |
| MIXING RATIOS | 4 PARTS A: 1 PART B BY VOLUM | 3/ |
| THINNING | R2K4 XYLENE @ 10% MAXIMUM | |
| ADDITION DATA | l 1st COAT | Znd COAT |
| DATE/TIME | 3/2/93 @ 9:00 A.M. | 3/13/93 @ 4:30 P.M. |
| Ha | 63% | 29% |
| TEMPERATURE | | 72F |
| SUBSTRATE CONDITION | SSPC VIS 1-C @ 2.5 MILS PROFILE | SURFACE TOL. BPOXY COATING (1ST COAT) |
| COATING BATCH NUMBERS | A: T2211/ B: T2340 | |
| THINNING | R2K4 XYLENE @ 10% | |
| EQUIPMENT | DEVILBISS MCB 704e | DEVILBISS MCB 704e |
| NUMBER OF COATS | | |
| SAG INDEX | 15 MILS / 7 MILS THINNED | 7 MILS THINNED 10% |
| | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT TOTAL |
| SAMPLE 13 | 5.5 | 5.5 |
| SAMPLE 14 | 6.9 | 5.3 |
| SAMPLE 15 | 5.9 | 5.7 |
| SAMPLE 16 | 5.5 | |
| SAMPLE 17 | 5.5 | |
| SAMPLE 18 | | 6.4 |

| PANEL EVALUATION | | | SU | RFACE 1 | OLERA | SURFACE TOLERANT EPOXY |
|--|----|-------|-----------------------|-----------------|-------|--|
| CLIENT: U.S. Army Corp of Eng. | | | | | | |
| DATE: 4/5/93 | | | | | | |
| EVALUATION HOURS: 336 | | | | | | |
| COATING EVALUATION DATA | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible effects |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | on any panels in this set 0 after 336 hours of exposure |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR CORROSIVE ENVIRONMENTS | | | | _ | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINA | FINAL EVALUATION ONLY | TION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | EVALUATION ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

| PANEL EVALUATION | | | SU | RFACE . | role | SURFACE TOLERANT EPOXY |
|---|----|-------|---------------|-----------|-------------|------------------------|
| CLIENT: U.S. Army Corp of Eng. |] | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM DATE: 4/19/93 | | | | | | |
| EVALUATION HOURS: 672 | | - 10 | | | | |
| COATING EVALUATION DATA | | _ | | _ | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0.0 | 0.03% | 0.03% |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | Í | | |
| OR COALED SPECIMENS SUBSECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | AL EVALUATION | TION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | FINAL | AL EVALUATION | TION ONLY | + | |
| RATING OF UNSCRIBED AREAS, | | | | | | 77 |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | ×1% | <1% |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 6 | o |

| PANEL EVALUATION | | | ns | RFACE | TOLE | SURFACE TOLERANT EPOXY | OXY |
|--|-------|-------|----|-----------------|----------|------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 5/17/93 EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 4 | 12 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | _ | _ | _ | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | | EVALUATION ONLY | - | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | EVALUATION ONLY | <u></u> | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | 0 | ×1% | ×1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | o | 6 | |
| | | | | | | | |

| PAINEL EVALUATION | | | ร | IRFACE TO | OLERA | SURFACE TOLERANT EPOXY |
|--|-------|-------|-----------|-----------------------|-------|---|
| | 1 | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | 1 | | | | | |
| DATE: 6/14/93 | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS |
| TEST DANEL NIMBER | 13 | 14 | 15 | 16 | 17 | 18 |
| LOJ LONGE NOMBEN | | | | | | No visible changes in this |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 0.03% | | 0.035 set of panels since previous (1344 hr.) evaluation. |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINA | AL EVALUA | FINAL EVALUATION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | 1 11 .11 | EVALUATION ONLY | | |
| RATING OF UNSCRIBED AREAS, | <1% | 0 | 0 | 0 <1 | ×1× | <1% |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | 6 | 6 |

| PANEL EVALUATION | | | S | JRFAC | E TOLE | SURFACE TOLERANT EPOXY | POXY |
|--|-------|-------|---------|--------------|--------|------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 7/12/93 | | | | | | | |
| EVALUATION HOURS: 2638 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | - EVAL | UATION ONL | ILY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | 1 11 11 | EVALUATION O | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | 0 | <1% | V1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | 6 | 6 | |
| | | | | | | | |

| PANEL EVALUATION | | | 0, | URFAC | E TOLE | SURFACE TOLERANT EPOXY | λXO |
|--|-------|-------|-----------------------|-----------------|--------|------------------------|---|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | , | | | | | | |
| DATE: 8/9/93 EVALUATION HOURS 3360 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 | 0.03% | 0.03% | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 9 | 8 | ω | 9 | 8 Blis | 8 Blistering is occurring only at the edge of the scribe. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Med. | Dense | Med. | Few | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | E | FINAL EVALUATION ONLY | JATION O | VLY. | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVAL | EVALUATION ONLY | NILY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | 0 | ×1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | 6 | 6 | |

AL13-18.XLS

| PANEL EVALUATION | | | | SURFA | CE TOL | ERANT | SURFACE TOLERANT EPOXY |
|--|-------|--------|--------|--------|--------|--------|-------------------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 9/13/93 | | | | | | | |
| EVALUATION HOURS 4032-FINAL | | | | | | 1 | |
| COATING EVALUATION DATA | 7 | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 | 0.03% | 0.03% | 0.03% Blistering has occurred |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 2 | 4 | 8 | 9 | 9 | only along the scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Medium | Medium | Medium | Medium | Medium | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | >1/8" | >1/8" | <1/8" | <1/8" | <1/8" | 1/16" | Loss of adhesion and |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | has occurred only under |
| TABLE 1, RATING NUMBER | 2 | വ | 9 | 9 | 9 | | 7 blisters along the scribe |
| RATING OF UNSCRIBED AREAS, | | | | | | | edges. |
| TABLE 2, % FAILED | <1% | 0 | 0 | 0 | <1% | <1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | 6 | 6 | |

| IIS ABMY CORP OF ENGINEERS | ALUMINUM | ALUMINUM EPOXY MASTIC PROGRAM |
|----------------------------|--|---|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | COLTURIET TCP ALUMINUM | *************************************** |
| MANIERCHIRER | SIGMA COATINGS | |
| VOLIME % SOLIDS | 80% +/-2% | *************************************** |
| | 2.0 LB/GAL (239 g/L) | |
| POT LIFE | 6 HOURS @ 68F | |
| INDICATION TIME | NONE | *************************************** |
| DRYING TIME MINIMUM | RECOAT 14 HOURS @ 68F / FULL CURE 5 DAYS | E 5 DAYS @ 68F |
| RECOMMENDED FILM THICKNESS | MILS PER COAT: DRY 5-8 / WET 6-9.6 | |
| MIXING RATIOS | 77 PARTS A: 23 PARTS B BY VOLUME | |
| - 1 | #91-92 THINNER @ 15% MAXIMUM | |
| | | TAGO FEE |
| APPLICATION DATA | 1st COAT | Zna COAT |
| DATE/TIME | 3/11/93 @ 8:00 A.M. | 3/12/93 @ 11:00 A.M. |
| I a | 28% | |
| TEMPERATURE | 70F | 75F |
| SUBSTRATE CONDITION | SSPC VIS 1.C @ 2.0 MILS PROFILE | COLTURIET TCP ALUMINUM |
| COATING BATCH NUMBERS | A: 188052 / B: 069112 | A: 188052 / B: 069112 |
| BUINNIHL | #91-92 @15% | #91-92 @ 15% |
| EQUIPMENT | DEVILBISS MBC 704E | DEVILBISS MBC 704E |
| NUMBER OF COATS | | |
| S A G INDEX | > 24 MILS / 16 MILS THINNED | 16 MILS THINNED 15% |
| | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT TOTAL |
| SAMPLE 37A | 6.5 | |
| SAMPLE 38A | | |
| SAMPLE 39 | 9 | |
| SAMPLE 40 | | 6.3 12 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 5 1 2 |
| SAMPLE 41 | | 10.3 |
| SAMPLE 42 | 5.7 | |

| | | | 2 | LIONE | 3 | COLTURIET TCP ALUMINUM | |
|---|-----|-------|---------------|----------------|---------|---|------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM | 1 | | | | | | |
| DATE: 4/5/93 | | | | | | | |
| EVALUATION HOURS: 336 | | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS | s |
| TEST PANEL NUMBER | 37A | 38A | 39 | 40 | 14 | 42 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There is no visible effect | offect |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | on any panel in this set O after 336 hours of exposure. | set exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | _ | | | _ | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| I ABLE 1, INCHES | | FINAL | AL EVALUATION | ATION ONL | >. | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | FIN | FINAL EVALU | EVALUATION ONL | <u></u> | | |
| RATING OF UNSCRIBED AREAS, | | | | : | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 101 | 10 | |

| PANEL EVALUATION | | | . TOO | TURIET | TCP A | COLTURIET TCP ALUMINUM | |
|--|-------|----------|--------------|-----------------|-------|------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. | 1 | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM | | | | | | | |
| EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | | _ | | | COMMENTS |
| TEST PANEL NUMBER | 37A | 38A | 39 | 40 | 41 | 42 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVALUA | EVALUATION ONL' | > | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | <u> </u> | FINAL EVALU | EVALUATION ONLY | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 10 | 10 | 10 | |

| | | | 3 | | 5 | COLI UNIET TOT ALCIVIINOINI |
|---|-------|-------|----|----------------|-------------|-----------------------------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 5/17/93 EVALUATION HOURS: 1344 COATING EVALUATION DATA | | | | | To the same | COMMENTS |
| TEST PANEL NUMBER | 37A | 38A | 39 | 40 | 41 | 42 |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0.03% | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | - | | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | | EVALUATION ONL | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | EVALUATION ONL | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | 0 | 0 | ×1% | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 10 | 6 | 0 | 10 |

| PANEL EVALUATION | | | COLTU | COLTURIET TCP ALUMINUM | P ALUN | MINUM | |
|---|-------|-------|------------|------------------------|--------|-------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 6/14/93 EVALUATION HOURS: 2016 | | 1 a | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 37A | 38A | 39 | 40 | 41 | 42 | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0 | 0.03% | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONLY | ZI. | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVA | EVALUATION 0 | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | 0 | <1% | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 101 | 6 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | 8 | LTURIE | T TCP | COLTURIET TCP ALUMINUM | M |
|--|-------|-------------|------------|-----------------|-------|------------------------|----------|
| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 7/12/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 37A | 38A | 39 | 40 | 41 | 42 | |
| ASTM D610 RUST GRADE | 0.03% | 0.03% | 0 | 0.03% | 0.03% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | _ | | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION C | ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | FINAL EVAL | EVALUATION ONLY | ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | <1% | <1% | 0 | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 10 | 6 | 6 | 10 | |
| | | 4 | | | | | |

| PANEL EVALUATION | | | ္ပ | LTURIE | COLTURIET TCP ALUMINUM | LUMIN | OM |
|---|--------|-------|------------|-----------------------|------------------------|-------|--------------------------------|
| CLIENT: U.S. Army Corp of Eng. | , 1 | | | | | | |
| ALUMINUM/EPOXY MASTIC PROGRAM DATE: 8/9/93 | | | | | | | |
| EVALUATION HOURS: 3360 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 37A | 38A | 39 | 40 | 41 | 42 | |
| ASTM D610 RUST GRADE | 0,03% | 0.03% | 0 | 0.03% | 0.03% | 0 8 | O Blistering has occurred only |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 9 | 80 | 8 | 8 | 9 | o control o control o |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Few | Few | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| DOING TO LINCAL TO LANGE COURT | | | | | | | |
| MEAN CREFAGE FROM SCRIBE, TABLE 1, INCHES | | | FINAL EVAL | EVALUATION ONLY | NLY | | |
| MEAN CREEPAGE FROM SCRIBE, | | | 1 11 | VINO NOIT VIII I VIII | > | | |
| TABLE 1, RATING NUMBER | | - | FINAL EVA | LOATION | JAC 1 | | |
| RATING OF UNSCRIBED AREAS, | V1% | V1% | 0 | <1% | ×1% | 0 | |
| TABLE 2, % FAILED | 7 | 2 | | | | | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 6 | 10 | 6 | 6 | 10 | |
| | | | | | | | |

| CLIENT: U.S. Army Corp of Eng. ALUMINUM/EPOXY MASTIC PROGRAM DATE: 9/13/93 EVALUATION HOURS: 4032-Final | | | | | | | The second secon |
|---|---------|---------|---------|-------|-------|------|--|
| | | | | | | | |
| N DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 37A | 38A | 33 | 40 | 41 | 42 | |
| ASTM D610 RUST GRADE 0.03% | 3% | 0.03% | 0 | 0.03% | 0.03% | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 2 | 2 | 4 | 8 | 9 | 4 | Blistering has occurred only |
| | | | | | | | along the scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY Me | Med. | Med/Den | Med/Den | Few | Faw | Med. | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | _ | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | "16" | 1/8" | 1/16" | 1/32" | 1/32" | 1/8" | Loss of adhesion and |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | underfilm rusting has |
| TABLE 1, RATING NUMBER | | | | | | | occurred only under |
| | 9 | 9 | 7 | 80 | 80 | 9 | 6 blisters at scribe edges. |
| JE UNSCRIBED AREAS, | + | | | | | | |
| TABLE 2, % FAILED | ×1 % | ×1% | 0 | <1% | <1% | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | o | ၈ | 10 | 6 | 6 | 10 | |

Appendix B: Epoxy/Urethane System Test Results

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| US ARMY CORPS OF ENGINEERS | EPOXY | EPOXY / URETHANE PROGRAM | |
|---------------------------------|------------------------|-----------------------------------|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | CARBOMASTIC 90 | CARBOTHANE 134HS | |
| MANUFACTURER | CARBOLINE | CARBOLINE | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| VOLUME % SOLIDS | 90% +/- 2% | 66% + /- 2% | |
| 200 | 0.70 LB/GAL 984 G/L) | 2.4 LB/GAL (288 G/L) | |
| POT LIFE | 4 HOURS AT 75F | 6 HOURS AT 75F | |
| INDUCTION TIME | NONE | NONE | |
| DRYING TIME MINIMUM TO RECOAT | 12 HOURS AT 75F | 8 HOURS AT 75F FULL CURE - 7 DAYS | ١٧s |
| RECOMMENDED FILM THICKNESS, DRY | 5 MILS PER COAT DRY | 2-4 MILS DRY / 3-6 MILS WET | |
| MIXING RATIOS | 1:1 BY VOLUME | 8 PARTS A: 1 PART B BY VOLUME | |
| | CARBOLINE NO. 2 | CARBOLINE NO. 214 | |
| | | | |
| APPLICATION DATA | | | |
| DATE/TIME | 4/8/93 @ 2:00 PM | 4/13/93 @ 2:00 P.M. | *************************************** |
| ВН | 55% | 20% | 000000000000000000000000000000000000000 |
| TEMPRATURE | 73F | 74F | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| SUBSTRATE CONDITION | SSPC VIS 1C | N/A | 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 |
| COATING BATCH NUMBERS | A: 2K375M B: 2H3301M | A: 2F2797M B: 2K0112C | |
| THINNING | 10% WITH NO. 2 THINNER | NONE | |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL | |
| NUMBER OF COATS | l | _ | |
| SAG INDEX | 20 MILS | 9 MILS | V |
| | | | |
| DRY FILM THICKNESS, MILS | 1ST COAT | 2ND COAT TOTAL | AL |
| SAMPLE 1 | 6.9 MILS | 5.5 MILS 12.4 MILS | MILS |
| SAMPLE 2 | 5.4 MILS | | MILS |
| SAMPLE 3 | 5.8 MILS | | MILS |
| SAMPLE 4 | 5.6 MILS | 4.3 MILS 9.9 MILS | VILS |
| SAMPLE 5 | | 3.5 MILS | MLS |
| SAMPLE 6 | 6.4 MILS | 4.8 MILS 11.2 MILS | MILS |
| | | | |

| PANEL EVALUATION | | CAR | BOMAS | TIC 90 / | CARB | CARBOMASTIC 90 / CARBOTHANE 134HS |
|--|----|-------|-------------|----------|------|--|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | |
| DATE: 5/10/93 EVALUATION HOURS: 336 | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS |
| TEST PANEL NUMBER | - | 2 | 8 | 4 | 2 | 9 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There ar no visible effects on any banels in this set |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | O after 336 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | _ | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | EVALUATION | ION ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | LEVALUATION | ION ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |

| PANEL EVALUATION | | CARE | 30MAS | TIC 90 / C | ARBO | CARBOMASTIC 90 / CARBOTHANE 134HS |
|--|-----|-------|-----------------|------------|--|-----------------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/24/93 EVALUATION HOURS: 672 | | | | | | |
| COATING EVALUATION DATA | _ | | | _ | Annual control of the | COMMENTS |
| TEST PANEL NUMBER | - | 2 | 8 | 4 | D | 9 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible effects |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | O after 672 hours of expsoure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | _ | | _ | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | EVALUATION ONL' | ON ONLY | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | EVALUATION | ON ONLY | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |

| TERING, SIZE O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | PANEL EVALUATION | | CARE | OMAST | / 06 OI | CARBO | CARBOMASTIC 90 / CARBOTHANE 134HS |
|--|--|----|-------|----------|---------|-------|-----------------------------------|
| 1 2 3 4 5 6 0 0 0 0 0 0 0 0 0 | CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/97 | | | | | | |
| ADE ADE OF BLISTERING, SIZE OF BLISTERING, SIZE OF BLISTERING, PAINTED OF BLISTERING, PREQUENCY OF BLISTERING, PREAD, PRE | COATING EVALUATION DATA | | | | | | COMMENTS |
| USTERING, SIZE O O O O O O O O O O O O O O O O O O | TEST PANEL NUMBER | - | 2 | 8 | 4 | ហ | 9 |
| CY | ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | |
| CY | ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | |
| FINAL EVALUATION ONLY | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| FINAL EVALUATION ONLY | ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | _ | |
| EAS, 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | EVALUATI | ON ONLY | | |
| BED AREAS 10 10 10 10 10 | MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | | ON ONLY | | |
| 10 10 10 10 10 | RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |

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| PANEL EVALUATION | | CAR | BOMAS | TIC 90 | / CARI | ЗОТНА | CARBOMASTIC 90 / CARBOTHANE 134HS |
|--|-----|-------|--------------|-----------|--------|--------------|-----------------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7/19/93 EVALUATION HOURS: 2016 | | | | | | | |
| COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | - | 2 | 8 | 4 | 2 | 9 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | FINAL | EVALUATION | TION ONLY | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | FINAL | - EVALUATION | TION ONLY | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 10 | 10 | 01 | 10 | 10 | |

| PANEL EVALUATION | | CARE | OMAS | / 06 JI | CARBC | THAN | CARBOMASTIC 90 / CARBOTHANE 134HS |
|--|----|-------|-----------------------|----------|-------------|--|-----------------------------------|
| | | | | | | | |
| CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | | |
| EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 8/16/93 | | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | L | |
| COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | | 2 | m | 4 | ro. | 9 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ACTM DATA DECREE OF RESTERING SIZE | 0 | 0 | 0 | 4 | 8 | 8 | Blistering on this set of |
| ASTIM DITT DEGREE OF DELOTERING, OFFI | | | | | ı | נ | panels is localized along |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 5 | _ Me | A D L | 2 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | STATE OF THE STATE | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | FINAL | FINAL EVALUATION ONLY | ION ONLY | | | |
| MFAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | FINAL | EVALUATION | ION ONLY | | | |
| | | | | | | | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 01 | 10 | 10 | 10 | 10 | 101 | |
| | | | | | | | |

| PANEL EVALUATION | | O | ARBOM | ASTIC | 90 / CA | RBOTH | CARBOMASTIC 90 / CARBOTHANE 134HS |
|--|------------------|-------|------------------|--------|---------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. FPOXY URFTHANF PROGRAM | | | | | | | |
| DATE: 9/13/93 | | | | | | | |
| EVALUATION HOURS: 3360-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | | | 2 3 | | 4 | 2 | 9 |
| | | | | | | | Blistering has occurred |
| ASTM D610 RUST GRADE | 0 | | 0 | | 0 | 0 | O only along the scribe edge |
| ACTM D714 DECDEF OF DISTEDING SIZE | | | | | 2 | α | in this set of panels 8 throughout the exposure |
| מיני לי הרמינה כן מיני הייני לי מיני הייני היי | | | | | | | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | | 0 | Few | w Few | Few | +- |
| | | | | | | | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | 1/32" | 1/64" | 1/64" | 1/32" | 1/64" | 1/64" | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | 8 | | 6 | 6 | 80 | 6 | 6 |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 200 | 10 | | 10 1 | 10 | 10 |
| % Gloss Betention (Ava. of all panels) 90.4% | Yellowing Index: | | 3.0% more vellow | vellow | | | |
| | | | | | | | |

| IIS ABMY CORPS OF ENGINEERS | EPOXY / | EPOXY / URETHANE PROGRAM | |
|--|-----------------------------|--|---|
| | | | |
| COATING SYSTEM DATA | | O A SOUTH A SOUTH | |
| COATING ID | CARBOMASTIC 15LO | CAKBOLHANE 134 HS | *************************************** |
| MANIJEACTURER | CARBOLINE | CAKBOLINE | |
| WANTED OF THE | 90% +/- 2% | 66% + /- 2% | |
| | 0,74 LB/GAL (88 G/L) | 2.4 LB/GAL (288 G/L) | *************************************** |
| 200 | 4 HOURS AT 75F | 6 HOURS AT 75F | |
| POLICIES TIME | NONE | NONE | |
| INDUCTION TIME | 24 HOURS TO RECOAT | 8 HOURS AT 75F FULL CURE - 7DAYS | AYS |
| DRYING TIME MINIMUM TO RECOM! | 5-7 MII S DRY / 5.5-7.5 WET | 2-4 MILS DRY 3-6 MILS WET | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| RECOMMENDED FILM I HICKNESS, DAT | 1-1 BY VOLUME | 8 PARTS A: 1 PART B BY VOLUME | ш |
| MIXING KATIUS | CARBOLINE NO. 76 | 2004(2008), 48-400-40.000 1, 88-40-4 1, 198-40-0 | |
| I DIMONING | | | |
| APPLICATION DATA | | Ma co. o o co. o o | |
| DA TE/TIME | 4/9/93 @ 9:00 AM | 4/13/93 @ 9:00 PM | |
| 12. CO | 25% | 20% | *************************************** |
| TENADOATIDE | 73F | 74F | *************************************** |
| CLIDETD ATE CONDITION | SSPC VIS1C | N/A | |
| SOBSTANTE CONDITION | A: 3A7722L B: 3A7697L | A: 2F2797M B: 2K0112C | |
| THE DATE OF THE PARTY OF THE PA | 15% WITH NO. 76 | NONE | *************************************** |
| HINNING | BINKS CONVENTIONAL | BINKS CONVENTIONAL | *************************************** |
| MIMBER OF COATS | 1 | | |
| O AG INDEX | >24 MILS | 6 MILS | 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - |
| | | | TOTAL |
| DRY FILM THICKNESS, MILS | | | 8 MIIS |
| SAMPLE 7 | | | 12 1 MIS |
| SAMPLE 8 | 6.1 MILS | 5,0 MILS | 3 MIS |
| SAMPLE 9 | | | 2 M S |
| SAMPLE 10 | | | 2.3 MILS |
| SAMPLE 11 | 5.0 MILS | | 11.8 MILS |
| SAMPLE 12 | 4.4 MILS | | |
| | | | |

| PANEL EVALUATION | | CARB | MASTI | C 15LC | / CAR | BOTH/ | CARBOMASTIC 15LO / CARBOTHANE 134HS |
|--|----|------|-------|--------|-------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 EVALUATION HOURS: 336 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 80 | 6 | 10 | - | 12 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | There are no effects visible |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | on any panels in this set after 336 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 01 | 10 | 10 | 10 | 10 | 01 | |

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| N |
| 7 |
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| w |
| Œ |
| - |

| PANEL EVALUATION | | CARB | MAST | IC 15L |) / CAF | звотн | CARBOMASTIC 15LO / CARBOTHANE 134 HS |
|---|----|------|------|--------|---------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | | |
| EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 5/24/93 | | | | | | | |
| EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 | = | 12 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ACTM D714 DECREE OF RISTERING SIZE | 0 | 0 | 0 | 0 | 0 | 0 | on any panels in this set after 672 hours of exposure. |
| אסווא סיו די מרסיירי טו מרסיירי | | | | | | | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 01 | 10 | 10 | 10 | |
| | | | | | | | |
| | | | | | | | |

| PANEL EVALUATION | | CARB | OMAST | IC 15L | O / CAF | CARBOMASTIC 15LO / CARBOTHANE 134HS |
|---|----|------|-------|--------|---------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/93 EVALUATION HOURS: 1344 | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 6 | 10 | 11 | 12 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | O There are no visible effects |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | on any panels in this set 0 after 1344 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 01 | 10 | 101 | 10 | 10 |
| | | | | | | |

| PANEL EVALUATION | | CARBO | MASTI | 15L0 | / CAR | зотна | CARBOMASTIC 15LO / CARBOTHANE 134 HS |
|---|----|-------|-------|------|-------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | | |
| EPOXY URETHANE PROGRAM DATE: 7/19/93 | | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | | S. C. |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | 8 | 0 | 10 | 1- | 12 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | • | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | | CARB | OMASTI | C 15L0 | / CAF | CARBOMASTIC 15LO / CAROTHANE 134 HS | 134 HS |
|--|-----|------|--------|--------|-------|-------------------------------------|----------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 8/16/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | ω | 6 | 10 | 1- | 12 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 All t | All blistering on this set |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 80 | 8 | 0 | 0 | 0 scril | scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | Med | Few | S - | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | NE NE | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | NH. | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | CARB | OMAS | ric 15L | O / CAF | BOTH/ | CARBOMASTIC 15L0 / CARBOTHANE 134 HS |
|---|---------------------|-------------|-------------------------|---------|---------|-------------|--|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 9/13/93 EVALUATION HOURS: 3360 | | | | | | of the same | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 7 | ω | 6 | 01 | = | 12 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Blistering on this set of panels has occurred only |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | ω | 0 | 0 | 0 | 0 | along the scribe edges throughout the exposure |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | MeM | Med | Few | 0 | 0 | 0 | O period. |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 3/32" | 1/16" | 1/32" | 1/64" | 1/64" | 1/32" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | σ | 7 | - α | 0 | 6 | ω . | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS % Gloss Retention (Average of all panels) 95.4% | 10 Yellow Index: | *********** | 10 10 64.1% more yellow | 0 T | 10 | 10 | |

| US ARMY CORP OF ENGINEERS | | EPOXY / URET | EPOXY / URETHANE PROGRAM | |
|----------------------------|--------------------------------|--|---------------------------------|----------|
| | | | | |
| COATING SYSTEM DATA | | | | |
| COATING ID | METAL PRIMER SSPC-25 RED OXIDE | -25 RED OXIDE | INDUSTRIAL ENAMEL TTE489 | E489 |
| MANUFACTURER | DAVIS INDUSTRIAL COATING | OATING | DAVIS INDUSTRIAL COATING | TING |
| VOLUME % SOLIDS | N/A | | N/A | |
| VOC | N/A | | N/A | |
| POT LIFE | N/A | | N/A | |
| INDUCTION TIME | N/A | | N/A | |
| DRYING TIME MINIMUM | N/A | ************************************** | N/A | |
| RECOMMENDED FILM THICKNESS | N/A | | N/A | |
| MIXING RATIOS | SINGLE COMPONENT | | SINGLE COMPONENT | |
| THINNING | T-120 SPRAYING THINNER | NNER | | |
| APPLICATION DATA | IST COAT | I 2ND COAT | 3RD COAT | |
| DATE/TIME | 4/12/93 @ 10:00 AM | 4/13/93 @ 10:00 AM | 4/14/93 @ 10:00 AM | |
| RH | 64% | 80% | %09 | |
| TEMPERATURE | 75F | 73F | 73F | |
| SUBSTRATE CONDITION | SSPC VIS. 1-C | SSPC-25 RED OXIDE | TTE489 ENAMEL | |
| COATING BATCH NUMBERS | 07172139 LOT 793 | 01133123 NONE | 01133123 NONE | |
| THINNING | NONE | NONE | NONE | |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL | BINKS CONVENTIONAL | |
| NUMBER OF COATS | 1 | 1ST | 2ND | |
| SAG INDEX | 5 MILS | 9 MILS | 6 MILS | |
| | | | | |
| DRY FILM THICKNESS, MILS | 1st COAT | 2nd COAT | 3rd COAT | TOTAL |
| SAMPLE 51 | 2.1 MILS | 2,4 MILS | 3.5 MILS | 8.0 MILS |
| SAMPLE 52 | 2.1 MILS | 2.0 MILS | 3.6 MILS | 7.7 MILS |
| SAMPLE 53 | 1.8 MILS | 2.3 MILS | 3.3 MILS | 7.4 MILS |
| SAMPLE 54 | 2.3 MILS | 2.5 MILS | 3.0 MILS | 7.8 MILS |
| SAMPLE 55 | 2.1 MILS | 3.3 MILS | 3.1 MILS | 8.5 MILS |
| SAMPLE 56 | 1.9 MILS | 2.9 MILS | 2.9 MILS | 7.7 MILS |

| PANEL EVALUATION | Š | SPC-2 | S RED O | XIDE / | TT-E-48 | SSPC-25 RED OXIDE / TT-E-489 ENAME | NEL |
|---|----|--|--|--|---|---|---|
| CLIENT: U.S. Army Corp of Eng. EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 5/10/93 EVALUATION HOURS: 336 | | | | | | | |
| COATING EVALUATION DATA | | | _ | _ | | | COMMENTS |
| TEST PANEL NUMBER | 51 | 52 | 53 | 54 | 52 | 56 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | 000000000000000000000000000000000000000 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEANS CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | | | | 正 | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | | | | 臣 | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 01 | 10 | 10 | 10 | 10 | |
| | | STATE OF THE PARTY | The state of the s | of chair in the ch | 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - | Total Control | |

| CLIENT: U.S. Army Corp of Eng. EPOXY URETHANE PROGRAM EVALUATION HOURS: 672 COATING EVALUATION DATA TEST PANEL NUMBER ASTM D610 RUST GRADE ASTM D714 DEGREE OF BLISTERING, SIZE ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1634 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS MEANS CREEPAGE FROM SCRIBE, TABLE 1, INCHES MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER TABLE 1, RATING NUMBER | 0 0 0 |
|--|-----------------------|
| OURS: 672 UATION DATA UATION OF PAINTED GREE OF BLISTERING, SIZE COREE OF BLISTERING, FREQUENCY CORE OF COREE OF BLISTERING, FREQUENCY CORE OF CORE OF COREE OF CORE OF CO | 8 0 |
| OURS: 672 UATION DATA UATION DATA UATION DATA IST GRADE IST G | 8 0 |
| ADE ADE OF BLISTERING, SIZE OF BLISTERING, SIZE OF BLISTERING, FREQUENCY OF BLISTERING, SIZE OF O | 88 0 |
| ADE OF BLISTERING, SIZE OF BLISTERING, FREQUENCY OF BLISTERING, FRE | 92 0 |
| 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 |
| NUENCY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | |
| 0 0 0 | 0 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS MEANS CREEPAGE FROM SCRIBE, TABLE 1, INCHES MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 0 0 Few |
| MEANS CREEPAGE FROM SCRIBE, TABLE 1, INCHES MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | FINAL |
| | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED 0 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS 10 10 10 1 | 10 10 10 |

| י טויבר בערטיים | 7 | SSPC-25 RED OXIDE / TT-E-489 ENAMEL | RED (| OXIDE / | TT-E-4 | 89 EN | AMEL |
|---|-------|-------------------------------------|-------|---------|--------|-------|--|
| CLIENT: U.S. Army Corp of Eng. | 1 - | | | | | | |
| EPOXY URETHANE PROGRAM DATE: 6/21/93 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 12 | 52 | 53 | 54 | 52 | 56 | 9 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | | O Blisters on Panel No. 51 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 0 | 9 | 4 | 0 | | are in scattered dense 6 groups. Others are |
| | | | | | | | localized along edges of |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | 0 | Med | Med | 0 | Me | Med the scribes. |
| ASTM D1654 EVALUATION OF PAINTED | ·, | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEANS CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 10% | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 9 | 10 | 10 | 10 | 10 | 10 | 100 M. 10 |

| PANEL EVALUATION | | SSPC- | SSPC-25 RED OXIDE / TT-E-489 ENAMEL | OXIDE , | / TT-E-4 | 89 ENA | MEL |
|---|-----|-------|-------------------------------------|---------|----------|--------|---|
| CHENT: U.S. Army Com of Eng. | 1 | | | | | | |
| EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 7/19/93 | | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | | |
| COATING EVALUATION DATA | П | | | | | | COMMENTS |
| TEST PANEL NUMBER | 51 | 52 | 53 | 54 | 55 | 56 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Except for Panel No. 51 |
| | | | | | 4 | u | all blistering is localized |
| ASTM D/14 DEGREE OF BLISTERING, SIZE | 0 | | 0 | † | | | along scillog adges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Med | Med | Dense | Med | Dense | Dense | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEANS CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 10% | | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | | 9 | 10 | 10 | 10 | 10 | 0.0000000000000000000000000000000000000 |

| PANEL EVALUATION | <u>88</u> | SPC-25 | RED 0 | XIDE / | SSPC-25 RED OXIDE / TT-3-489 ENAMEL | 9 ENA | MEL |
|--|-----------|--------|-------|--------|-------------------------------------|-------|---|
| CLENT: U.S. Army Com of End. | J | | | | | | |
| SCHOOK USETHANE PROGRAM | | | | | | | |
| DATE: 8/16/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 51 | 52 | 53 | 24 | 55 | 56 | |
| ASTM DE10 BUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Except for Panel No. 51 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 8 | 4 | 4 | 2 | 4 | blistering is along the scribe edges only. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Med | Dense | Dense | Dense | Dense | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEANS CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | 7001 | | c | C | C | | |
| TABLE 2, % FAILED | % 0 | > | | | | | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 9 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | | SSPC-2 | 5 RED | SSPC-25 RED OXIDE / TT-P-489 | 7T-P-7 | 681 | |
|--|--------------------------------|-----------|-------------|------------------------------|--------|-------|---|
| CLIENT: U.S. Army Corp of Eng. | | | | | | | |
| DATE: 9/13/93 | | | | | | | |
| EVALUATION HOURS: 3360 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 51 | 52 | 53 | 54 | 55 | 56 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | | 0 Except for Panel 51. all |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 9 | 4 | 4 | 4 | 4 | blistering is localized along scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Dense | Dense | Dense | Dense | Dense | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEANS CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/32" | 1/64" | 1/8" | 1/8" | 3/16" | 1/8" | 0.000 |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 8 | 6 | 9 | 9 | 2 | ဖ | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 10 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 9 | 10 | 10 | 10 | 10 | 9 | - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 |
| % Gloss Retention (average of all panels): 58% | Yellowing Index: 40% yellowing | ndex: 40% | 6 yellowing | | | | |

| US ARMY CORPS OF ENGINEERS | EPOXY / UR | EPOXY / URETHANE PROGRAM |
|---------------------------------|-------------------------------|-------------------------------|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | BAR RUST 236 | DEVTHANE 379 |
| MANUFACTURER | DEVOE | DEVOE |
| VOLUME % SOLIDS | 80% | 62% |
| VOC | 1.4 LB/GAL (170 G/L) | 2.7 LBS/GAL (327 G/L) |
| POT LIFE | 4 HOURS AT 77F | 8 HOURS AT 77F |
| INDUCTION TIME | 15 MINS AT 77F | NONE |
| DRYING TIME MINIMUM TO RECOAT | 5 HOURS | FULL CURE 16-24 HOURS AT 77F |
| RECOMMENDED FILM THICKNESS, DRY | 5-8 MILS DRY, 6.2-10 MILS WET | 2-3 MILS DRY, 3-3.5 MILS WET |
| MIXING RATIOS | 4 PART A: 1 PART B BY VOLUME | 4 PARTS A: 1 PART B BY VOLUME |
| THINNING | 10% MAXIMUM WITH T-10 THINNER | 5% MAX WITH T-9 THINNER |
| ADDITION DATA | | |
| NATE CALION DATA | 4/18/03 @ 0.30 AM | 14/17/93 |
| | 710/00 G 0.00 DW | |
| | | 9/ 70 |
| TEMPRATURE | 74F | 73F |
| SUBSTRATE CONDITION | SSPC VIS, 1-C | BAR RUST 236 |
| COATING BATCH NUMBERS | A: N302089A B: N302135A | A: N212141C B: C208157 |
| THINNING | NONE | NONE |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL |
| NUMBER OF COATS | | - |
| SAG INDEX | 13 MILS | 6 MILS |
| DRY FILM THICKNESS, MILS | 1ST COAT 2 | 2ND COAT TOTAL |
| SAMPLE 25 | 5.6 MILS | 4.03 MILS 9.9 MILS |
| SAMPLE 69 | | |
| SAMPLE 70 | 5.0 MILS | Y |
| SAMPLE 71 | | 2.80 MILS 7.9 MILS |
| SAMPLE 96 | 4.8 MILS | |
| SAMPLE 97 | | |
| | | |

| PANEL EVALUATION | | | BAR RI | BAR RUST 236 / DEVTHANE 379 | 3 / DEV | THAN | E 379 |
|--|----|----------|--------|-----------------------------|---------|------|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 EVALUATION HOURS: 336 | | S | | | | | |
| COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | 25 | 69 | 70 | 11 | 96 | 97 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | _ | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | BAR RU | ST 236 | / DEVT | BAR RUST 236 / DEVTHANE 379 |
|--|----|----|--------|--------|--------|-----------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | |
| EPOXY URETHANE PROGRAM | | | | | | |
| DATE: 5/24/93 | | | | | | |
| EVALUATION HOURS: 672 | | | | | | |
| COATING EVALUATION DATA | | _ | | _ | | COMMENTS |
| TEST PANEL NUMBER | 25 | 69 | 70 | 71 | 96 | 97 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | FINAL EVALUATION ONLY |
| TABLE 1, INCHES MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 |
| | | | | | | |

| PANEL EVALUATION | | | BAR RU | ST 236 | BAR RUST 236 / DEVTHANE 379 | THAN | E 379 |
|--|-----|-----|--------|--------|-----------------------------|------|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | _ | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 25 | 69 | 70 | 71 | 96 | 97 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 8 | 8 | 0 | 9 | 8 | ainig sciine edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | Few | 0 | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | BAR R | UST 23 | BAR RUST 236 / DEVTHANE 379 | /THAN | E 379 |
|--|-----|-----|-------|--------|---------------------------------------|--|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7(19993 | | | | | ak. | 4 | |
| EVALUATION HOURS: 2016 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 25 | 69 | 70 | 71 | 96 | 97 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | All blistering is localized along scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 9 | 80 | 88 | 9 | 9 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Med | Med | Med | Dense | Dense | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 101 | 10 | 10 | 10 | |
| | | | | | # # # # # # # # # # # # # # # # # # # | ************************************** | |

| PANEL EVALUATION | | | BAR | RUST 2 | BAR RUST 236 / DEVTHANE 379 | VTHAN | E 379 |
|--|-------|-----|-----|--------|-----------------------------|-------|-----------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 8/16/93 | | | | | | | |
| EVALUATION HOURS: 2688 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 25 | 69 | 70 | 7.1 | 96 | 97 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | All blistaring is localized |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 9 | 9 | 9 | 9 | 9 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | Dense | Med | Med | Мвд | Dense | Med | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINA L EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 01 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | BAR | RUST | BAR RUST 236 / DEVTHANE 379 | EVTHAN | IE 379 |
|--|---------------------|-------|-------------------------|--------------|-----------------------------|--------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| EVALUATION HOURS: 3360-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 25 | 69 | 70 | 17 | 1 96 | 3 97 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 9 | 9 | | 9 | 9 | only along the scribe edges throughout the exposure |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Dense | Dense | Dense | Dense | Dense | ·nolled |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 5/32" | 1/16" | 1/32" | 1/32" | 1/32" | >1/16" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | l ls | 7 | 8 | | 8 | 9 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS % Gloss Retention (average of all panels): 92.3% | 10 Yellowing Index: | | 10 10 82.6% more yellow | 10 yellow | 0 10 | 10 | |

| US ARMY CORPS OF ENGINEERS | EPOXY / UR | EPOXY / URETHANE PROGRAM | |
|---------------------------------|----------------------------------|-------------------------------|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | BAR RUST 239 | DEVTHANE 379 | |
| MANUFACTURER | DEVOE | DEVOE | |
| VOLUME % SOLIDS | %06 | 62% | |
| Noc | 0.72 LB/GAL (86 G/L) | 2.7 LB/GAL (327 G/L) | |
| POT LIFE | 4 HOURS AT 77F | 8 HOURS AT 77F | |
| INDUCTION TIME | 15 MIN AT 77F | NONE | |
| DRYING TIME MINIMUM TO RECOAT | 8 HRS. RECOAT / 24 HRS FULL CURE | 16-24 HRS. FULL CURE | |
| RECOMMENDED FILM THICKNESS, DRY | 6-8 MILS DRY / 6.7-8.9 MILS WET | 2-3 MILS DRY / 3-3.5 WET | |
| MIXING RATIOS | 1 PART A:1 PART B BY VOLUME | 4 PARTS A: 1 PART B BY VOLUME | |
| THINNING | 12 MILS | T-9 THINNER AT 5% MAX. | |
| | | | ### 1 |
| APPLICATION DATA | | | |
| DATE/TIME | 4/6/93 @ 10:00 AM | 4/7/93 @ 10:30 AM | |
| ВН | %09 | 62% | *************************************** |
| TEMPRATURE | | 73F | • |
| SUBSTRATE CONDITION | SSPC VIS. 1-C | BAR RUST 239 | |
| COATING BATCH NUMBERS | A: N210202 B: N21061 | A: N212141-C B: C208157B | |
| THINNING | 10% WITH T-4 THINNER | NONE | |
| EQUIPMENT | BINKS CONVENTIONAL | CONVENTIONAL | |
| NUMBER OF COATS | | - | |
| SAG INDEX | 12 MILS | 6 MILS | |
| | | | |
| DRY FILM THICKNESS, MILS | 1ST COAT | | TOTAL |
| SAMPLE 31A | 4.8 MILS | 5.1 MILS 9.9 | 9.9 MILS |
| SAMPLE 32A | 6.1 MILS | | 8.7 MILS |
| SAMPLE 33 | 6.1 MILS | | 8.6 MILS |
| SAMPLE 34 | 5.9 MILS | | MILS |
| SAMPLE 67 | 5.6 MILS | | 8.9 MILS |
| SAMPLE 68 | 5.7 MILS | 3.3 MILS 9.0 | MILS |
| | | | Department |

| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 EVALUATION HOURS: 336 COATING EVALUATION DATA TEST PANEL NUMBER 31A | | | | 1 | 1000 | |
|--|---------------------------------------|-------|----|----|------|----------------------------|
| TA A | | | | | | |
| | | | | | | |
| | | | | | | COMMENTS |
| | | 32A 3 | 33 | 34 | 67 | 89 |
| ASTM D610 BUST GRADE | 0 | 0 | 0 | 0 | 0 | O There were no visible |
| | | - | | C | 0 | O this set after 336 hours |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | > | | | of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTW D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | VINO MOLEVILLAND |
| TABLE 1, RATING NUMBER | | | - | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, | | | | | 1 | |
| | 0 | 0 | 0 | 0 | 0 | 0 |
| | 10 | 10 | 10 | 10 | 10 | 10 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | | 2 | 2 | 2 | 2 |

| PANEL EVALUATION | | | BAR R | BAR RUST 239 / DEVTHANE 379 | 9 / DE | VTHA | VE 379 |
|--|-----|-----|-------|------------------------------------|--------|--|--|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/24/93 | | | | | | | |
| EVALUATION HOURS: 372 | | | | | | | |
| COATING EVALUATION DATA | | | | _ | | | COMMENTS |
| TEST PANEL NUMBER | 31A | 32A | 33 | 34 | 67 | 9 | 88 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | | O There were no visible |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | | effects on any panels in O this set after 672 hours |
| | | | | | | | of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | Ban share Ban sh | 0 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| O COMPOSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | | O |
| | | | | | | | |

| | COMMENTS |
|-------|---------------------------|
| | |
| 34 67 | 89 |
| 0 0 | O All blistering on these |
| | panels is tocalized along |
| 0 | 8 the scribe edges. |
| Med 0 | PeM |
| | |
| | |
| | |
| | |
| | |
| | FINAL EVALUATION ONLY |
| | |
| | FINAL EVALUATION ONLY |
| | |
| 0 | 0 |
| 10 10 | 10 |
| 0 2 | 0 01 |

| PANEL EVALUATION | | | BAR | RUST 2 | 39 / DE | VTHA | BAR RUST 239 / DEVTHANE 379 |
|---|-----|-----|-----|--------|---------|------|--|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7/19/93 | | | | | | | The state of the s |
| EVALUATION HOURS: 2016 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 31A | 32A | 33 | 34 | 67 | 89 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 9 | 9 | 9 | 0 | | 6 All blistering is localized |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF BAINTER | Med | Мед | Med | Med | 0 | Med | along scribe edge. |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | | | BAR | BAR RUST 239 / DEVTHANE 379 | 39 / DE | VTHAN | IE 379 |
|---|-----|-------|-------|-----------------------------|---------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 8/16/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 31A | 32A | 33 | 34 | 67 | 89 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 9 | 9 | 9 | 9 | 9 | Blistering is localized along the scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | Med | Dense | Dense | Dense | Med | Dense | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | | | BAR | SUST 2 | BAR RUST 239 / DEVTHANE 379 | VTHAN | IE 379 |
|---|----------------------------------|-----------|-----------|--------|------------------------------------|-------|--------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 9/13/93 EVALUATION HOURS: 3360 | | | | 4 | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 31A | 32A | 33 | 34 | 67 | 68 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 9 | 9 | 9 | 9 | | 6 throughout the testing |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Dense | Dense | Dense | Dense | Dense | , none |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/16" | 1/16" | 5/64" | 5/64" | 5/64" | 1/16" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 7 | 7 | 9 | 9 | 9 | 7 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| % Gloss Retention (average of all panels): 13.7% | Yellowing Index: 82.4% yellowing | Index: 82 | 4% yellow | ing | | | |

| DEVARN 224 DEVARN 224 DEVARN 224 DEVARN 224 DEVOITE DE | I S ARMY CORPS OF FNGINEERS | EPOXY / UI | EPOXY / URETHANE PROGRAM | |
|--|--|-----------------------------------|--|---|
| DEVRAN 224 DEVRAN 239 | | | | |
| DEVOIDED | COATING SYSTEM DATA | 700 100 | 00 00 00 00 00 00 00 00 00 00 00 00 00 | |
| Control | COATING ID | DEVRAIN 224 | | |
| A | MANUFACTURER | UEVOE | 100 | |
| Lie | VOLUME % SOLIDS | 90.7% 9 84 1 B/G M 1 (340 G/1) | 2.7 LBS/GAL (327 G/L) | |
| NONE NONE | VOC | S HOLIRS AT 77F | 8 HOURS AT 77F | |
| 5 HOURS 5 HOURS 6 HOURS 4-6 MILS DRY, 6.7-10 MILS WET 1 PART A: 1 PART B BY VOLUME 10% MAXIMUM WITH T-10 THINNER 10% MAXIMUM W | POT LIFE | 30 MIN AT 77F | NONE | |
| 4.6/93 © 9:00 AM 5.2 MILS 5.2 MILS 5.2 MILS 5.3 MILS 5.4 MILS 4.9 MILS 5.6 MILS 5.6 MILS 5.6 MILS 5.9 MI | INDUCTION TIME | | FULL CURE 16-25 HOUF | 3S |
| 1-76 | DRYING TIME MINIMUM TO RECOAT | A & MILS DRV & 7-10 MILS WET | 2-3 MILS DRY, 3.3-5 MI | ILS WET |
| 10% MAXIMUM WITH T-10 THINNER 5% MAX WITH T-9 | RECOMMENDED FILM THICKNESS, DRY | 1PART A -1 PART R RY VOLUME | 4 PARTS A: 1 PART B | BY VOLUME |
| 4/6/93 @ 9:00 AM | MIXING RATIOS | 10% MAXIMIM WITH T-10 THINNER | 5% MAX WITH T-9 THII | NNER |
| 4/6/93 @ 9:00 AM 4/7/93 @ 9:00 AM 62% | | | | |
| TETTIME 62% APRATURE 62% APRATURE 73F BSTRATE CONDITION 73F ATING BATCH NUMBERS A1 NO10092C B: C008007 A1 NO12141C B: DEVRAN 224 ATING BATCH NUMBERS A1 NO10092C B: C008007 A1 NO12141C B: DEVRAN 224 NONE BINKS CONVENTION A1 NONE BINKS CONVENTIONAL A1 NONE G INDEX A3 MILS AY FILM THICKNESS, MILS A3 MILS AY FILM THICKNESS, MILS A3 MILS BMPLE 91 A3 MILS BMPLE 92 B.S. MILS 5.0 MILS B.S. MILS 5.0 MILS B.A. MILS A.9 MILS B.A. MILS A.9 MILS B.A. MILS BAPLE 94 B.A. MILS BAPLE 95 B.A. MILS BAPLE 95 B.A. MILS <td>APPLICATION DATA</td> <td>MA OC.O S COLOR</td> <td></td> <td></td> | APPLICATION DATA | MA OC.O S COLOR | | |
| A TAFE | DATE/TIME | 4/6/93 @ 9:00 AIVI | 2007 | |
| Activities Act | RH | | 07.70 | *************************************** |
| SSPC VIS. 1-C DEVRAN 224 | TEMPRATURE | | 737 | *************************************** |
| A: N010092C B: COOBOO! MINITED FINE DELTA | SUBSTRATE CONDITION | SSPC VIS. 1-C | DEVRAN 224 | 18157 |
| 1 1 1 1 1 1 1 1 1 1 | COATING BATCH NUMBERS | A: N010092C B: C00800/ | NONE | |
| 1 1 1 1 1 1 1 1 1 1 | THINNING | NONE | DINING CONVENTIONAL | *************************************** |
| 1 1 1 1 1 1 1 1 1 1 | EQUIPMENT | BINKS CONVENTIONAL | | |
| THICKNESS, MILS 13 MILS 14.3 MILS 2.8 MILS 2.8 MILS 3.0 MILS 5.0 MILS 5.5 MILS 4.9 MILS 5.6 MILS 5.6 MILS 5.6 MILS 5.9 MILS 5.9 MILS | NUMBER OF COATS | /OJ CJ:0110. | | |
| 1ST COAT 2ND COAT 2.8 MILS 2.8 MILS 3.0 MILS 5.0 MILS 5.0 MILS 5.5 MILS 3.4 MILS 5.6 MILS | 2000 2000 2000 2000 2000 2000 2000 200 | 13 MILS I HINNED 5% | Same C | |
| 4.3 MILS 2.8 MILS 5.2 MILS 3.0 MILS 5.0 MILS 2.9 MILS 4.9 MILS 3.4 MILS 5.6 MILS 2.9 MILS | ANY THE THEORY WILE OF THE COURT OF THE COUR | 1ST COAT | 2ND COAT | TOTAL |
| 5.2 MILS 3.0 MILS 5.0 MILS 3.2 MILS 5.5 MILS 2.9 MILS 4.9 MILS 3.4 MILS 5.6 MILS 2.9 MILS | DAY FILM I DICKINGSS, WILD | 4.3 MILS | 2.8 MILS | 7.1 MILS |
| 5.0 MILS 3.2 MILS 2.9 MILS 3.4 MILS 3.4 MILS 5.6 MILS 2.9 MILS 3.4 MILS 2.9 | SAMILE 30 | 5.2 MILS | : | 8.2 MILS |
| 5.5 MILS 2.9 MILS 3.4 MILS 5.6 MILS 2.9 MILS 2.9 MILS | SAMPI F 92 | | • | O A MILS |
| 4.9 MILS 3.4 MILS 2.9 MILS 2.9 MILS | SAMPLE 93 | | • | S IN C |
| 5.6 MILS | SAMPLE 94 | | | 8.5 MILS |
| | SAMPLE 95 | 5.6 MILS | 2. 2 miles | |

| PANEL EVALUATION | | | DEVRA | IN 224 | DEVRAN 224 / DEVTHANE 379 | THAN | 379 |
|--|----|----|---|--------|---------------------------|------|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 EVALUATION HOURS: 336 | | | 10 - 12 - 12 - 12 - 12 - 12 - 12 - 12 - | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 06 | 91 | 92 | 93 | 94 | 95 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 101 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | DEVR | DEVRAN 224 / DEVTHANE 379 | 4 / DEV | THAN | E 379 |
|---|----|----|------|---------------------------|---------|------|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/24/93 EVALUATION HOURS: 672 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 06 | 91 | 92 | 93 | 94 | 95 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | O | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES MEAN CREEPAGE FROM SCRIBE, TARIF 1, RATING NI MARER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 101 | 101 | 10 | 10 | |

| PANEL EVALUATION | | | DEVR | AN 224 | DEVRAN 224 / DEVTHANE 379 | THANE | 379 |
|---|-----|-----|------|--------|---------------------------|-------|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/93 EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | 06 | 91 | 92 | 93 | 94 | 95 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 4 | 0 | 4 | 4 | 4 | along scribe auges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | 0 | Med | Few | Med | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | _ | | _ | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | | DEVR/ | 4N 224 | DEVRAN 224 / DEVTHANE 379 | HANE | 379 |
|--|---|-----|-------|--------|---------------------------|------|-------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7/19/93 | | | | | | | |
| EVALUATION HOURS: 2016 COATING EVALUATION DATA | | | | _ | | | COMMENTS |
| TEST PANEL NUMBER | 06 | 91 | 92 | 93 | 94 | 92 | |
| ASTM D610 RUST GRADE | 0.03% | 0 | 0 | 0 | 0 | 0 | Blistering is along the |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 4 | 8 | 4 | 4 | 4 | scribe edges only. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Med | Few | Med | Med | Med | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | _ | _ | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | L. | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 6 | 10 | 101 | 10 | 10 | 10 | |
| | | | | | | | |

| CLIENT: U.S. ARMY CORPS OF ENG. COMMENTS FOATING EVALUATION DATA 90 91 92 93 94 95 ASTIM DOTA DEGREE OF BLISTERING, FREQUENCY 0 0 0 0 0 0 ASTIM DOTA DEGREE OF BLISTERING, FREQUENCY Dones Med Med Med Med Med Med All bistering on this set of positive along section and set of positive along section and section and set of positive along section and sec | PANEL EVALUATION | | | DEV | RAN 2 | 24 / DE | DEVRAN 224 / DEVTHANE 379 | E 379 |
|--|---|-------|-----|-----|-------|---|---------------------------------------|---|
| ERING, SIZE ERING, FREQUENCY FAINTED FORMING S., S., S., S., S., S., S., S. | CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| Second Size | DATE: 8/16/93 EVALUATION HOURS: 2688 | - | | | | | | |
| NING, SIZE 6 | COATING EVALUATION DATA | | | | | | | COMMENTS |
| INING, SIZE 6 4 6 2 4 4 4 RING, FREQUENCY Dense Med Med Med Dense TED TED O 0 0 0 0 0 0 O 0 0 0 0 0 O 0 0 0 0 | TEST PANEL NUMBER | 06 | 91 | 92 | 93 | | | |
| AING, SIZE 6 4 6 2 4 4 4 11 10 10 10 10 10 11 1 | ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | | | |
| Ning, FREQUENCY Dense Med Med Med Dense Mainted Med Dense Med Dense Med Med Dense Med Med Dense Med Dense Med Dense Med Med Dense | ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 4 | 9 | | | | |
| STED Med Med Med Dense AINTED TED Med Med Dense TED O <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>scribe edges.</td></t<> | | | | | | | | scribe edges. |
| TED AREAS 10 10 10 10 10 10 10 | ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Med | Med | Meo | 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - | 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | 1,000 |
| FED AREAS 10 10 10 10 10 10 | ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| ED AREAS 10 10 10 10 10 10 10 | OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| O O O O O O O O O O O O O O O O O O O | MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| O O O O O O O O O O O O O O O O O O O | MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| 10 10 10 10 10 | RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | | | | |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 0 | 10 | 12 | | | 100 c 201 c |
| | | | | | | | | |

| PANEL EVALUATION | | | DEVE | 1AN 22 | DEVRAN 224 / DEVTHANE 379 | THANE | 379 |
|--|------------------|------|-----------------|--------|----------------------------------|--------------|-------------------------|
| | | | | | | | |
| CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | | |
| EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 9/13/93 | | | | | | | |
| EVALUATION HOURS: 3360-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | | | | <u> </u> | COMMENTS |
| TEST PANEL NUMBER | 06 | 91 | 92 | 93 | 94 | 95 | |
| DANG TOTAL STATE | C | 0 | 0 | 0 | 0 | 0 | Blistering is localized |
| ASIM DOID RUST GRADE | | | | | | | along scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 4 | 9 | 2 | 4 | 4 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Med | Med | Med | Med | Dense | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | 1/16" | 1/8" | 1/64" | 3/16" | 1/8 | 8/1 | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | 7 | g | 6 | D. | 9 | 9 | |
| RATING OF UNSCRIBED AREAS. | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2 BATING # OF LINECRIBED AREAS | 101 | 10 | 10 | 10 | 10 | 10 | |
| TABLE 2, NATING # OF CONCENTED OFFICE | - | | | | | | |
| % Gloss Retention (average of all panels): 99.3% | Yellowing Index: | | 81.5% yellowing | ing | | | |

| US ARMY CORPS OF ENGINEERS | EPOXY / U | EPOXY / URETHANE PROGRAM | |
|---------------------------------|---------------------------------|---------------------------------|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | HEMPADUR 4515/1987 | HEMPATHANE 5521/1148 | |
| MANUFACTURER | HEMPEL | HEMPEL | |
| VOLUME % SOLIDS | 82% | 53% | |
| NOC | 1.5 LB/GAL (180 G/L) | 3.8 LBS/GAL 450 G/L | |
| POT LIFE | 3 HOURS AT 68F | 2 HOURS AT 68F | |
| INDUCTION TIME | NONE | NONE | |
| DRYING TIME MINIMUM TO RECOAT | RECOAT 8 HOURS, 6 DAYS MAX. | 8HRS TO TOUCH, 7 DAYS FULL CURE | JRE |
| RECOMMENDED FILM THICKNESS, DRY | 8 MILS DRY 10 MILS WET PER COAT | 2 MILS DRY, 4 MILS WET | |
| MIXING RATIOS | 1 PART A: 1 PART B | 7 PARTS A:1 PART B | |
| DNINNHL | 5% MAX WITH NO. 0846 THINNER | 0808/0888 5% MAX. | |
| | | | |
| APPLICATION DATA | | | |
| DATE/TIME | 4/13/93 @ 8:00 AM | 4/14/93 @ 9:00 AM | 1 |
| RH | 25% | %09 | 000000000000000000000000000000000000000 |
| TEMPRATURE | 72f | 73F | |
| SUBSTRATE CONDITION | SSPC VIS.1-C | HEMPADUR 4515-1987 | |
| COATING BATCH NUMBERS | A: UH2820323 B: UH1030166 | A: UH392086 B: UH4320918 | |
| THINNING | 5% WITH NO. 0846 THINNER | NONE | |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL | |
| NUMBER OF COATS | _ | | |
| SAG INDEX | 20 MILS | | |
| | | | |
| DRY FILM THICKNESS, MILS | 1ST COAT | 2ND COAT TOI | TOTAL |
| SAMPLE 39 | 10.1 MILS | 1.7 MILS 11.8 | .8 MILS |
| SAMPLE 40 | 7.75 MILS | 9 MILS | 9.6 MILS |
| SAMPLE 41 | | MILS | 9.0 MILS |
| SAMPLE 42 | | | 9.4 MILS |
| SAMPLE 43 | 8.00 MILS | | 9.9 MILS |
| SAMPLE 44 | 7.10 MILS | 2.2 MILS 9.3 P | 9.3 MILS |
| | | | |

| PANEL EVALUATION | 里 | MPAD | HEMPADUR 4515-1987 / HEMPATHANE | 5-1987 | / HEM | PATHA | INE 5521-1148 |
|--|----|------|---------------------------------|--------|-------|-------|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 | | | | | | | |
| EVALUATION HOURS: 336 COATING EVALUATION DATA | | | | | | | PLANTENTO |
| TEST PANEL NUMBER | 39 | 40 | 41 | 42 | 43 | 44 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| | | | | | | | |
| MEAN CREFAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | I | EMPAI | JUR 45 | 15-198 | 7/HEMI | PATHA | HEMPADUR 4515-1987/HEMPATHANE 5521-1148 |
|--|----|-------|---------------|--------|--------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/24/93 FVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | _ | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 39 | 40 | 41 | 42 | 43 | 44 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | 10 1 10 000000000000000000000000000000 |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | _ | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | 000000000000000000000000000000000000000 |
| | | | | | | | |

| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/93 EVALUATION HOURS: 1344 COATING EVALUATION DATA TEST PANEL # ASTM D610 RUST GRADE ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED ASTM D1654 EVALUATION OF PAINTED | 39 | | | | | | |
|---|-----|-----|-----|-----|-------|---------|-----------------------------|
| TERING, FREQUENCY Few | 39 | | | | | | |
| A 39 39 39 50 50 50 50 50 50 50 50 50 50 50 50 50 | 66 | | | | | | |
| UATION DATA 33 ST GRADE EGREE OF BLISTERING, SIZE EGREE OF BLISTERING, FREQUENCY EVALUATION OF PAINTED | 39 | | | | 200.0 | | |
| UST GRADE GGREE OF BLISTERING, SIZE EGREE OF BLISTERING, FREQUENCY Fow EVALUATION OF PAINTED | 39 | | | | | | COMMENTS |
| LISTERING, SIZE 4 LISTERING, FREQUENCY Few | _ | 04 | 14 | 42 | 43 | 44 | |
| NUENCY Faw | 0 | 0 | 0 | 0 | 0 | 0 | |
| ENCY Few | 4 | 4 | 4 | 9 | 2 | 6 All b | All blistering is localized |
| | Few | Med | Med | Few | Med | Med | |
| | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO COMPOSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINA | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINE | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, 0 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS 0 0 | 0 | 0 | 0 | 0 | 0 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | H | MPAD | UR 451 | 5-1987 | / HEMI | PATH/ | HEMPADUR 4515-1987 / HEMPATHANE 5521-1148 |
|--|-----|------|--------|--------|--------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7/19/93 EVALUATION HOURS: 2016 | A | | | | | | |
| COATING EVALUATION DATA | - | _ | | | | | COMMENTS |
| TEST PANEL NUMBER | 39 | 40 | 41 | 42 | 43 | 44 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Blistering is localized |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 4 | 4 | 9 | 2 | 9 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | Med | Med | peW | Few | Med | MeM | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | = | IEMPA | JUR 451 | 5-1987 | / HEMF | HEMPADUR 4515-1987 / HEMPATHANE 5521-1148 | 21-1148 |
|---|----------|--------------|----------------|--------|--------|---|-----------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 8/16/93 FVALUATION HOURS: 2688 | | | | | | | |
| | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 39 | 40 | 41 | 42 | 43 | 44 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 4 | 4 | 9 | 2 | 2 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | PeW | Med | Med-Den | PeW | peW | Dense | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINAL EV | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EV | EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 10 | 10 | 101 | 101 | 10 | |

| PANEL EVALUATION | H | MPAD | UR 45 | 15-198 | 37 / HE | MPATH | HEMPADUR 4515-1987 / HEMPATHANE 5521-1148 |
|--|--|-----------------|----------------|-----------|---------|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 9/13/93 EVALUATION HOURS: 3360 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 39 | 4 | 41 | 42 | 43 | | 44 Bletering is localized |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | | 0 | O along scribe adges. |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 4 | 4 | 9 | | 2 | 2 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | Dense | Dense | Dense | Dense | Dense | Dense | 72) |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/32" | 1/16" | 1/8" | 1/32" | 1/8" | 1/8" | *** |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 0 | 7 | 9 | 8 | | 9 | 9 |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS % Gloss Retention (average of all panels): 99.3% | 10 10 10 10 Yellowing Index: 75.1% yellowing | 10 lex: 75.1 | 10 % yellow | 10 ing | 10 | | 10 |

| US ARMY CORPS OF ENGINEERS | EPOXY / UI | EPOXY / URETHANE PROGRAM | |
|---------------------------------|---------------------------------|--------------------------|--|
| COATING SYSTEM DATA | | | |
| COATING ID | INTERGARD H.S., UNIVERSAL EPOXY | INTERTHANE | |
| MANUFACTURER | PORTER INTERNATIONAL | PORTER INTERNATIONAL | |
| VOLUME % SOLIDS | 80% +/- 2% | 57% +/- 2% | |
| VOC | 1.6 LB/GAL (192 G/L) | | |
| POT LIFE | 4 HOURS AT 75F | 10 HOURS AT 75F | |
| INDUCTION TIME | 15 MIN AT 75F | NONE | |
| DRYING TIME MINIMUM TO RECOAT | 6 HOURS | 24 HOURS AT 75F | |
| RECOMMENDED FILM THICKNESS, DRY | 4-8 MILS DRY / 6-10 MILS WET | 1.5-2.0 DRY 3-5 WET | |
| MIXING RATIOS | 4 PARTS A: 1 PART B BY VOLUME | FX | |
| THINNING | THINNER #T-44 AT 6% MAX. | GTA415 | |
| | | | |
| APPLICATION DATA | | | 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 |
| DATE/TIME | 4/19/93 @ 8:00 А.М. | 4/20/93 @ 8:00 A.M. | |
| ВН | %09 [°] | 28% | |
| TEMPRATURE | 74F | 73F | |
| SUBSTRATE CONDITION | SSPC VIS, -1C | N/A | |
| COATING BATCH NUMBERS | A: UHA10993C B: UHA13313C | NOT LEGIBLE | |
| THINNING | %9 | NONE | |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL | |
| NUMBER OF COATS | 1 | | |
| SAG INDEX | 13 MILS THINNED 6% | e MILS | 7. 200 |
| DRY FILM THICKNESS, MILS | 1ST COAT | ZND COAT TOTAL | |
| SAMPLE 13 | 6.3 MILS | 3.6 MILS 9.9 MILS | <u></u> |
| SAMPLE 14 | ž. | 2.7 MILS | (0 |
| SAMPLE 15 | 6.5 MILS | 2.6 MILS 9.1 MILS | " |
| SAMPLE 16 | | 3.5 MILS 9.5 MIL | " |
| SAMPLE 17 | 5.7 MILS | | (0 |
| SAMPLE 18 | 5.3 MILS | 2.0 | S |
| | | | The second secon |

| PANEL EVALUATION | = | VTERGA | RD H.S. | UNIVE | RSAL | EPOXY | INTERGARD H.S. UNIVERSAL EPOXY/INTERTHANE |
|--|----------|--------|---------|-------|------|--------------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 5/10/93 EVALUATION HOURS: 336 | | | | | | | |
| COATING EVALUATION DATA | | | | _ | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE FNVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE. | | | | | | | |
| TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | INTERG | ARD H. | S. UNIV | FRSAL | EPOX | INTERGARD H.S. UNIVERSAL EPOXY/INTERTHANE |
|---|----|--------|--------|---------|-------|------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/24/93 EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 4 | 15 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | N. | TERG/ | RD H. | S. UNI | VERSA | L EPO | INTERGARD H.S. UNIVERSAL EPOXY/INTERTHANE |
|--|----|---|-------|--------|---|-------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | | 18 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | | 0 | 0 |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 101 | 10 | 10 | 10 | | 01 |
| | | 100 100 | | | 10 de | | |

| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | |
|---|----|----|----|----|----|-----------------------|
| | | | | | | |
| DATE: 7/19/93 | | | | | | |
| CVALCON DOCUMENT | | | | | | COMMENTS |
| COATING EVALUATION DATA | | | | | | |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 |
| ASTM D714 DEGREE OF BLISTERING FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | |
| | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINAL EVALUATION ONLY |
| Julion Programme and Programme | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EVALUATION ONLY |
| RATING OF LINSCRIPED AREAS. | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 01 |

| CLIENT; U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
|--|-----|------|----|----|----|----------|-----------------------|
| DATE: 8/16/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | φ | 0 | 0 | 0 | ω | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | Few | 0 | 0 | 0 | Faw | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | 正 | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | V 1% | 0 | 0 | 0 | % 1 % | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 6 | 10 | 0. | 10 | 6 | |

| PANEL EVALUATION | | N | ERGAR | D H.S. | UNIVER | SAL/IN | INTERGARD H.S. UNIVERSAL/INTERTHANE |
|---|------------------|--|-------------------|--------|--------|--------|-------------------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 9/13/93 EVALUATION HOURS: 3360 - FINAL | | | | | | | |
| | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 13 | 14 | 15 | 16 | 17 | 18 | |
| ASTM DETO BIST CBADE | | C | | • | | | Blistering has occurred |
| 7000 0000 0000 | | > | > | | > | 2 | throughout the exposure |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 9 | 0 | 0 | 0 | 8 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | Few | 0 | 0 | 0 | Few | |
| ASTM D1654 EVALUATION OF PAINTED | Г | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| I O CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | 1/32" | 1/64" | 1/64" | 0 | 1/64" | 1/64" | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, RATING NUMBER | 8 | 6 | 6 | 10 | 6 | 6 | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| % Gloss Rention (average of all panels): 94.1% | Yellowing Index: | 0000000 0000000 0000000 0000000 | 80.6% more yellow | rellow | | | |
| | | | | | | | |

| US ARMY CORPS OF ENGINEERS | EPOXY | EPOXY / URETHANE PROGRAM | |
|---------------------------------|-------------------------|----------------------------------|--|
| COATING SYSTEM DATA | | | |
| COATING ID | SURFACE TOLERANT EPOXY | HI SOLIDS POLYURETHANE | |
| MANUFACTURER | SHERWIN-WILLIAMS | SHERWIN-WILLIAMS | |
| VOLUME % SOLIDS | 80% +/- 2% | 65% + /- 2% | |
| VOC | 1.45 LB/GAL (174 G/L) | 2.40 LB/GAL (289 G/L) | |
| POT LIFE | 4 HOURS AT 77F | 4 HOURS AT 77F | |
| INDUCTION TIME | 15 MIN AT 77F | NONE | |
| DRYING TIME MINIMUM TO RECOAT | 18 HOURS | RECOAT: 18HRS FULL CURE: 10 DAYS | : 10 DAYS |
| RECOMMENDED FILM THICKNESS, DRY | 6 MILS DRY / 7 MILS WET | 2 MILS DRY / 4.5 MILS WET | |
| MIXING RATIOS | 6 PARTS A: 1 PART B | 4 PARTS A: 1 PART B | |
| THINNING | R2K4 XYLENE AT 10% MAX. | R7K69 AT 15% MAX | |
| | | | |
| APPLICATION DATA | | - | |
| DATE/TIME | 4/10/93 @ 10:00 A.M. | 4/14/93 @ 10:00 AM | ************************************** |
| ВН | 52% | %95 | |
| TEMPRATURE | 72F | 73F | |
| SUBSTRATE CONDITION | SSPC VIS. 1-C | N/A | |
| COATING BATCH NUMBERS | A: T2592 B: t592 | A: 620-4978 B: 630-4281 | |
| THINNING | R2K4 XYLENE AT 5% | none | |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL | |
| NUMBER OF COATS | | | |
| SAG INDEX | 8 MILS THINNED 5% | S MILS | |
| | 1400 101 | TAND COAT | IVIOI |
| DRY FILM I HICKNESS, MILS | ISI COAI | ZND COAT | IOIAL |
| SAMPLE 27 | 6.5 MILS | 3.4 MILS | 9.9 MILS |
| SAMPLE 28 | | 3.3 MILS | 10.9 MILS |
| SA,MPLE 29 | | 3.5 MILS | 10.0 MILS |
| SAMPLE 30 | 6.4 MILS | 2.4 MILS | 8.8 MILS |
| SAMPLE 31B | 7.2 MILS | 2.9 MILS | 10.1 MILS |
| SAMPLE 32B | 6.0 MILS | 2.6 MILS | 8.6 MILS |
| | | | |

| PANEL EVALUATION | | SURFA | CE TOLE | RANT E | H/AX0c | SOLIDS | SURFACE TOLERANT EPOXY/HI-SOLIDS POLYURETHANE |
|--|----|-------|---------|--------|--------|--------|--|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 | | | | | | | |
| EVALUATION HOURS: 336 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 27 | 28 | 29 | 30 | 318 | 328 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | | O There was no visible effect |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | | on any panel in this set 0 after 336 hours of exposure. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | SURFA | CE TOLE | RANT EP | -IH/XXO | SOLIDS | SURFACE TOLERANT EPOXY/HI-SOLIDS POLYURETHANE |
|---|---|--|---|---------|---------|--------|---|
| | | | | | | | |
| CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | | |
| EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 5/24/93 | | | | | | | |
| EVALUATION HOURS: 672 | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 27 | 28 | 29 | 30 | 31B | 32B | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | |
| TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, | | | | | | | FINAL EVALUATION ONLY |
| יייייייייייייייייייייייייייייייייייייי | | | | | | | |
| RATING OF UNSCRIBED AREAS, | | | | | | | |
| TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | ************************************** | | | | | | |
| | Description Control Control | STATE OF THE PARTY | 100 100 100 100 100 100 100 100 100 100 | | | | |

| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/93 EVALUATION HOURS: 1344 COATING EVALUATION DATA TEST PANEL NUMBER | | | | | | | |
|---|-----|-----|----|----|-----|----------|-------------------------|
| | | | | | | | |
| | _ | | | | | | |
| A | | | | | | | |
| | | | | | | | |
| 2 | | | | _ | | <u>_</u> | COMMENTS |
| | 27 | 28 | 53 | 30 | 318 | 32B | |
| | 0 | 0 | 0 | 0 | 0 | 0 | Blistering on Panel 32B |
| | | | | | | | occurred at the edges |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 88 | of the scribe. |
| ACTAL DECREE OF DI ICTEDIAIO EDECLIENCY | C | 0 | 0 | 0 | 0 | Few | |
| | | | | | | | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE. | | | | | | | |
| TABLE 1, INCHES | | | | | | ш. | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE | | | | | | | |
| TABLE 1, RATING NUMBER | | | | | | L | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS. | | | | | | • | |
| | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 101 | 10 | 10 | 101 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | SURFAC | E TOLE | RANT EP | OXY/HI- | SOLIDS | SURFACE TOLERANT EPOXY/HI-SOLIDS POLYURETHANE |
|---|----|--------|--------|---------|---------|---|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7/19/93 | | | | | 47 | | |
| EVALUATION HOURS: 2016 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 27 | 28 | 29 | 30 | 318 | 32B | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Blistering on Panel 32B is |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | | 8 scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | Med. | |
| AS IN DIEST EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 101 | 10 | 10 | 10 | 10 | |
| | | | 1111 | | | (c) | |

| PANEL EVALUATION | | SURFACE | TOLER | ANT EPC | XY/HI-S | OLIDS P | SURFACE TOLERANT EPOXY/HI-SOLIDS POLYURETHANE |
|---|----|---------|-------|---------|---------|---------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 8/16/93 EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | | _ | | | COMMENTS |
| TEST PANEL NUMBER | 27 | 28 | 29 | 30 | 318 | 32B | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | ω | 0 | 8 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | Few | 0 | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | _ | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | ×1× | 0 | ×1% | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 6 | 10 | 6 | |
| | | | | | | | |

| PANEL EVALUATION | | SURFAC | E TOLER | ANT EPO | XY/HI-SC | OLIDS PC | SURFACE TOLERANT EPOXY/HI-SOLIDS POLYURETHANE |
|---|-------------------------|------------|----------------------------|-------------|----------|----------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 9/13/93 EVALUATION HOURS: 3360-FINAL | | | 4 | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 27 | 28 | 29 | 30 | 318 | 32B | Risters have occurred only |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | along the scribe edges |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 8 | 0 | 8 | period. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | Few | 0 | T & | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/32" | 0 | 1/32" | 1/32" | 0 | 1/64" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 8 | 10 | - ω | ω | 10 | 6 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS % Gloss Retention (average of all panels): 38.3% | 10 Yellowing Index: | 1000000000 | 10 10 53.2% more yellow | 10 allow | 01 | 10 | |

| US ARMY CORPS OF ENGINEERS | EPOXY / UR | EPOXY / URETHANE PROGRAM |
|--------------------------------|---|---------------------------|
| | | |
| COATING SYSTEM DATA | | |
| COATING ID | MACROPOXY ALUMINUM | ACROTHANE |
| MANUFACTURER | SHERWIN WILLIAMS (COOK). | SHERWIN WILLIAMS (COOK) |
| VOLUME % SOLIDS | 80% | 61% +/- 2% |
| VOC | 1.5 LB/GAL ((175 G/L) | 2.88 LB/GAL (346 G/L) |
| POT LIEE | 40 MIN @ 75F | 1.5 HOURS @ 75F |
| INDICTION TIME | 15 MIN @ 75F | NONE |
| DOVING TIME MINIMINATO RECOAT | RECOAT 18-24 HOURS | 7 DAYS FULL CURE |
| BECOMMANDED EILM THICKNESS DRY | 6 MILS DRY, 7 MILS WET | 1.2-2.5 DRY, 2.5-4.0 WET |
| MAYING DATIOS | 1 PART A: 2 PARTS B BY VOLUME | 7 PARTS A: 1 PART B |
| THINING | 250-C-357 (XYLENE) | 5% MAX WITH #A19 THINNER |
| | | |
| APPLICATION DATA | | |
| DATE/TIME | 4/10/93 @ 9:00 AM | 4/11/93 @ 10:30 AM |
| HØ | 51% | 55% |
| TEMPRATURE | 73F | 72F |
| SUBSTRATE CONDITION | SSPC VIS. 1-C | |
| COATING BATCH NUMBERS | A: 38-1991010140/1-017 B: 3819912052164 | A: 38199115507 B: 700c505 |
| HINNING | 10% WITH 250-C-357 XYLENE | NONE |
| EQUIPMENT | BINKS CONVENTIONAL | BINKS CONVENTIONAL |
| NUMBER OF COATS | | |
| SAG INDEX | 12 MILS | e MILS |
| | | |
| DRY FILM THICKNESS, MILS | 1ST COAT | |
| SAMPLE 45 | 2.0 MILS | 2.1 MILS |
| SAMPLE 46 | 5.1 MILS | 2.1 MILS |
| SAMPLE 47 | 5.4 MILS | |
| SAMPLE 48 | 5.8 MILS | 2.9 MILS |
| SAMPLE 49 | 5.8 MILS | 2.2 MILS |
| SAMPLE 50 | 5.9 MILS | 2.1 MILS |
| | | |

| PANEL EVALUATION | | MA | CROPOX | CY ALU | MINUM | MACROPOXY ALUMINUM - ACROTHANE | |
|--|----|----|--------|--------|-------|--------------------------------|-----------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/10/93 EVALUATION HOURS: 336 | | | | | | | |
| COATING EVALUATION DATA | | | | _ | | COMP | COMMENTS |
| TEST PANEL NUMBER | 45 | 46 | 47 | 48 | 49 | 20 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | _ | | | | _ | _ | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINAL EVALUATION ONLY | TION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EVALUATION ONLY | TION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 101 | 10 | 101 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | MA | CROPO | XY ALL | JMINUN | / ACI | MACROPOXY ALUMINUM / ACROTHANE |
|---|----|----|-------|--------|--------|-------|--------------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 5/24/93 EVALUATION HOURS: 672 COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 45 | 46 | 47 | 48 | 49 | 50 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | 0 | 0 | 0 | 0 | 0 | 0 | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | | MA | CROPO | XY ALL | JMINUN | 1 / AC | MACROPOXY ALUMINUM / ACROTHANE |
|--|-------|-----|-------|--------|--------|--------|--------------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/93 | | | | | | | |
| EVALUATION HOURS: 1344 | | | | | | | |
| COATING EVALUATION DATA | | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 45 | 46 | 47 | 48 | 49 | 20 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | All blistering is localized |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 9 | 9 | 4 | 9 | 00 | _ |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | Dense | PeW | Few | Dense | Few | Few | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | MA | CROPO | XY ALU | MINUM | MACROPOXY ALUMINUM / ACROTHANE |
|---|-------|-----|-------|--------|-------|--------------------------------|
| OHA LO CALCO XXXIII | | | | | | |
| CLIEN I: U.S. AKMY CORPS OF ENG. | | | | | | |
| DATE: 7/19/93 | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS |
| TEST PANEL NUMBER | 45 | 46 | 47 | 48 | 49 | 50 |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 All blistering is along the |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 9 | 9 | 4 | 9 | 6 scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Med | Med | Dense | Med | Med |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | |
| OR COALED STECHNERS SUBSECTED TO CORROSIVE ENVIRONMENTS | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | .0 | 0 | 0 | 0 | 0 | 0 |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 101 | 10 | 10 | 10 | 10 |
| | | | | | | |

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| PANEL EVALUATION | | MA | CROPO | XY ALU | MINUM | I / ACI | MACROPOXY ALUMINUM / ACROTHANE |
|--|-------|-----|-------|--------|-------|---------|--------------------------------|
| | | | | | | | |
| FPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 8/16/93 | | | | | | | |
| EVALUATION HOURS: 2688 | | | | | | | |
| COATING EVALUATION DATA | | | _ | | | | COMMENTS |
| TEST PANEL NUMBER | 45 | 46 | 47 | 48 | 49 | 20 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 4 | 4 | 2 | 4 | 2 | scille adges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Med | Dense | peW | Med | Med | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 01 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | Z | CROPC | XY AL | UMINU | M / ACR | MACROPOXY ALUMINUM / ACROTHANE |
|---|------------------|-------|-----------------|-------|-------|---------|--------------------------------|
| | | | | | | | |
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| DATE: 9/13/93 | | | | | | | |
| EVALUATION HOURS: 3360-FINAL | | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 45 | 46 | 47 | 48 | 49 | 20 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | All blistering is localized |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 4 | 4 | 4 | 2 | 4 | 2 | along the scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Dense | Dense | Dense | Dense | Dense | Dense | |
| ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 7/64" | 3/64" | 5/64" | 9/64" | 5/64" | 3/64" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 9 | 7 | 9 | S | 9 | 7 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 101 | 10 | 10 | 10 | 10 | 101 | |
| % Gloss Retention (average of all panels): 70.3% | Yellowing Index: | | 94.1% yellowing | bu | | | |

| US ARMY CORPS OF ENGINEERS | EPOXY / | EPOXY / URETHANE PROGRAM | |
|---------------------------------|-----------------------------|---|---|
| | | | |
| COATING SYSTEM DATA | | | |
| COATING ID | EPTCP ALUMINUM | VHSA POLYURETHANE | |
| MANUFACTURER | SIGMA COATINGS | SIGMA COATINGS | *************************************** |
| VOLUME % SOLIDS | 80% + /- 2% | *************************************** | |
| NOC | 2 LBS/GAL (239.6 G/L) | 3.10 LB/GAL (371.5 G/L) | *************************************** |
| POT LIFE | 6 HOURS AT 68F | 4 HOURS AT 68F | *************************************** |
| INDUCTION TIME | NONE | NONE | *************************************** |
| DRYING TIME MINIMUM TO RECOAT | 5 HOURS | 12HRS MIN 5 DAYS @ 77F FULL CLIRE | CURE |
| RECOMMENDED FILM THICKNESS, DRY | 5-8 MILS DRY | 2-3 MILS DRY | |
| MIXING RATIOS | 3.35:1 BY VOL 5.66 BY WT. | 4.88:1 BY VOLUME 5,25:1 BY WT | MT. |
| LHINNING | 10% MAX. WITH #9192 THINNER | 6% MAX WITH #91-88 THINNER | *************************************** |
| APPLICATION DATA | | | |
| DATE/TIME | 4/19/93 @ 8:00 AM | 4/19/93 @ 4:00 PM | |
| ВН | 65% | 64% | *************************************** |
| TEMPRATURE | 75F | 76F | *************************************** |
| SUBSTRATE CONDITION | SSPC VIS1C | FPTCP ALLIMINIM | *************************************** |
| COATING BATCH NUMBERS | A: 232-052 B: 136-023 | A: 035-023 B: 088-112 | *************************************** |
| THINNING | 10% WITH #91-92 THINNER | NONE | |
| EQUIPMENT | CONVENTIONAL | BINKS CONVENTIONAL | *************************************** |
| NUMBER OF COATS | | | |
| SAG INDEX | 14 MILS | | |
| DOVEL M TUICKNESS AND | | | |
| ONT FILM I FILMNESS, MILS | 1ST COAT | 2ND COAT TC | TOTAL |
| SAINFLE 5/ | 5.3 MILS | 4.3 MILS 9.6 | 9.6 MILS |
| SAMPLE 58 | | | 9.4 MILS |
| SAMPLE 59 | 6.9 MILS | 4.5 MILS 11.4 | 11.4 MILS |
| SAMPLE 60 | | 4.0 MILS | 12.1 MILS |
| SAMPLE 61 | • | 3.7 MILS | 9.6 MILS |
| SAMPLE 62 | 7.0 MILS | 3.2 MILS | 10.2 MILS |
| | | | |

| CLIENT: U.S. ARMY CORPS OF ENG. | PANEL EVALUATION | | PTCP A | LUMINU | IM / VH | SA POL | YURE | EPTCP ALUMINUM / VHSA POLYURETHANE FINISH |
|---|--|--------------|--------|--------|---------|--------|--|---|
| FERING, SIZE | CLIENT: U.S. ARMY CORPS OF ENG. | | | | | | | |
| ST GRADE | EPOXY URETHANE PROGRAM | | | | | | | |
| ERING, SIZE O O O O O O O O O O O O O | DATE: 5/10/93 EVALUATION HOURS: 336 | | | | | | | |
| ERING, SIZE O O O O O O O O O O O O O | | - | | | | | | COMMENTS |
| ADE ADE OF BLISTERING, SIZE OF BLISTERING, SIZE | COATING EVALUATION DATA | | | | | | 10000000000000000000000000000000000000 | COMMENT |
| NUENCY 10 10 10 10 10 10 10 10 10 1 | TEST PANEL NUMBER | 22 | 28 | 29 | 09 | 61 | 62 | |
| NUENCY 10 10 10 10 10 10 10 10 10 1 | ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| EQUENCY O 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| AS 10 10 10 10 10 | ACTAM DATA DECREE OF BLISTERING FREDLIENCY | | 0 | 0 | 0 | 0 | 0 | |
| AS 10 10 10 10 10 10 10 | AS IM D/14 DEGREE OF BEISTENING; THE COUNCY | |) | | - | | | |
| AS 10 10 10 10 10 | ASTM D1654 EVALUATION OF PAINTED | | | | | | | |
| SED AREAS 10 | OR COATED SPECIMENS SUBJECTED | - | | | | | | |
| FROM SCRIBE, NUMBER RIBED AREAS, © 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | TO CORROSIVE ENVIRONMENTS | | _ | | | | | |
| EAS, CARIBED AREAS TO 10 10 10 10 10 10 10 10 10 10 10 10 10 | MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| BED AREAS 10 10 10 10 | MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| BED AREAS 10 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | RATING OF UNSCRIBED AREAS, | | | | | | | |
| 10 10 10 10 10 | TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| | TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |

| PANEL EVALUATION | EP | TCP AL | UMINU | J / VH | SA POL | YURETH/ | EPTCP ALUMINUM / VHSA POLYURETHANE FINISH |
|--|----|--------|-------|--------|--|---------|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | | | | |
| EVALUATION HOURS: 672 | • | | | | | | |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 22 | 28 | 29 | 09 | 61 | 62 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO COMPOSIVE ENVIRONMENTS | | | | 10 | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINA | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL | L EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | The second secon | | |

| PANEL EVALUATION | | PTCP A | LUMIN | JM / VI | HSA POI | YUR | EPTCP ALUMINUM / VHSA POLYURETHANE FINISH |
|---|-----|--------|-------|---------|---------|-----|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 6/21/93 EVALUATION HOURS: 1344 COATING EVALUATION DATA | | | | | - 10 A | | COMMENTE |
| TEST PANEL NUMBER | 57 | 28 | 29 | 09 | 61 | 62 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | All blistering is localized |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 8 | 8 | 0 | 8 | 8 | 8 | along scribe edges. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | 0 | Few | Few | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 01 | 10 | 200000000000000000000000000000000000000 |
| | | | | | | | |

| PANEL EVALUATION | | EPTC | P ALUN | MONIL | / VHSA | EPTCP ALUMINUM / VHSA POLYURETHANE | |
|--|-----|------|--------|-------|--------|---|-----------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 7/19/93 | | | | | | | |
| EVALUATION HOURS: 2016 | | | | | | | |
| COATING EVALUATION DATA | | _ | | | | COMMENTS | ENTS |
| TEST PANEL NUMBER | 57 | 28 | 59 | 09 | 61 | 62 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 8 | 0 | 9 | 9 | All blistering is localized 8 along scribe edges. | calized 3S. |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Few | Few | 0 | Few | Med | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | | | | | | | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | FINAL EVALUATION ONLY | ION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | FINAL EVALUAT | EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | | EPTC | P ALU | MINUM | / VHSA | POLY | EPTCP ALUMINUM / VHSA POLYURETHANE |
|--|-----|------|-------|---------|--------|------|------------------------------------|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM | | | | 2. | | | |
| DATE: 8/16/93 EVALUATION HOURS: 2688 | | | | | | | 9. a. |
| COATING EVALUATION DATA | | | | | | | COMMENTS |
| TEST PANEL NUMBER | 57 | 28 | 29 | 9 | 61 | 62 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 | Distriction is also the |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 0 | 0 | 9 | 9 | 4 | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY | Med | 0 | 0 | Med-Den | Med | Few | |
| ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED TO CORROSIVE ENVIRONMENTS | | | | _ | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | | | | | | | FINAL EVALUATION ONLY |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | | | | | | | FINAL EVALUATION ONLY |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS | 10 | 10 | 10 | 10 | 10 | 10 | |
| | | | | | | | |

| PANEL EVALUATION | <u> </u> | PTCP A | LUMIN | JM / V | HSA PO | EPTCP ALUMINUM / VHSA POLYURETHANE FINISH | |
|---|------------------------|---------------------------------------|-----------------------|--|--------|---|---|
| CLIENT: U.S. ARMY CORPS OF ENG. EPOXY URETHANE PROGRAM DATE: 9/13/93 EVALUATION HOURS: 3360 | | | | The second secon | | | |
| COATING EVALUATION DATA | | | | | | COMMENTS | |
| TEST PANEL NUMBER | 57 | 28 | 29 | 9 | 19 | 62 | |
| ASTM D610 RUST GRADE | 0 | 0 | 0 | 0 | 0 | 0 0 | 1 |
| ASTM D714 DEGREE OF BLISTERING, SIZE | 9 | 00 | 4 | 9 | 9 | 4 along scribe edges. | |
| ASTM D714 DEGREE OF BLISTERING, FREQUENCY ASTM D1654 EVALUATION OF PAINTED OR COATED SPECIMENS SUBJECTED | DeW. | Med | Med | Med | Med | Med | |
| TO CORROSIVE ENVIRONMENTS | | | | | | | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, INCHES | 1/32" | 1/64" | 1/64" | 1/32" | 1/32" | 1/64" | |
| MEAN CREEPAGE FROM SCRIBE, TABLE 1, RATING NUMBER | 8 | 0 | 0 | 8 | 8 | 6 | |
| RATING OF UNSCRIBED AREAS, TABLE 2, % FAILED | 0 | 0 | 0 | 0 | 0 | 0 | |
| TABLE 2, RATING # OF UNSCRIBED AREAS % Gloss Retention (average of all panels): 92.1% | 10 Yellowing Index: | 10 10 10 10 10 10 10 10 | 10 10 86.7% yellowing | 10 | 01 | 10 | |

Appendix C: Commercial Item Description of a Coating System for Minimally Prepared Atmospheric Steel-Aluminum Epoxy Mastic

Abstract

This commercial item description covers the requirements for a high build aluminum pigmented epoxy coating system. The product shall be suitable for application at temperatures of 40 °F (4.4 °C) and above to minimally prepared rusted and/or painted ferrous metal substrates. Wide latitude is afforded the formulator provided the product meets the specification requirements when tested as described herein. The coating shall not contain lead, chromium, cadmium, or chlorinated solvents. In addition to the manufacturers standard label, the product shall be labeled with the title and number of this commercial item description.

Salient Characteristics

The coating shall comply with the following requirements.

Application Properties¹

The coating shall not sag, run, or streak when applied by brush, spray, or roller at the manufacturer's recommended thickness.

Appearance of the Dried Paint Film2

The dried paint film shall have no visible cracks or fractures.

¹ The coating shall be applied at the manufacturer's recommended film thickness by brush, roller, and conventional and airless spray.

² The applied paint shall be inspected under 30X magnification after drying for 1 week.

C2 USACERL TR 96/01

Dry Time3

The coating shall dry hard in not more than 16 hours.

Pot Life⁴

The viscosity of the mixed coating shall not increase by more than 10 Krebs units (KU) in 3 hours.

Intercoat Adhesion⁵

When tested as specified, the coating shall exhibit no intercoat delamination.

Accelerated Corrosion Resistance⁶

None of the six test panels shall blister adjacent to the scribe earlier than the inspection at 2688 hours. No more than 1, 4, and 6 test panels shall blister adjacent to the scribe at 2688, 3360, and 4032 hours respectively. For all six test panels, the average numerical blister rating for the area adjacent to the scribe shall not be less than 6.5. The blister rating shall be the average of the sum of the average numerical ratings for frequency and size. Frequency ratings shall be converted as follows: 10 = none, 8 = few, 6 = medium, 4 = medium dense, 2 = dense, 0 = total. Any blistering not immediately adjacent to the scribe shall be cause for rejection. The average rust rating for the six panels and the minimum rust rating for any one test panel shall not be less than 9.0. The rust undercut rating for any panel shall not be less than 6.0 and the average rust undercut rating for all six panels shall be greater than 6.0. The sum of the average rust, blister, and undercut scores shall not be less than 23.0.

The time to dry hard shall be determined for the epoxy coating applied at the recommended film thickness in accordance with ASTM D 523-89.

⁴ The initial viscosity of a 1-qt (0.095 L) sample of thoroughly mixed coating shall be determined by ASTM D 562. The viscosity shall be measured a second time after 3 hr.

Two successive coats of the test material shall be spray-applied to the designated dry film thickness. The applied paint shall be cured and aged at 70 to 75 °F (21 to 24 °C) and 50 ±10 percent relative humidity for 72 hr between coats and for 7 days after the application of the second coat. A sharp knife shall be used to produce two parallel scribes through the coating approximately 1 in. long and 1/4-in. apart. A third scribe shall be made perpendicular to and through the parallel scribes. The knife shall be used to determine the intercoat adhesion by attempting to delaminate the second coat from the first along the perpendicular scribe.

⁶ The corrosion resistance of the aluminum epoxy mastic system shall be evaluated using this test procedure.

USACERL TR 96/01 C3

Volatile Organics⁷

The volatile organic content of the mixed and thinned coating shall not exceed 350 g/L.

Preparation of Test Specimens

Pre-rusted test specimens measuring 3.0 x 9.0 x 0.125 in. shall be prepared in accordance with SSPC Coatings Test Panel Preparation Specification No. 1, *Uncontaminated Rusted Steel* (SSPC Draft Specification No. 2, January 1995).

Application of Paint System

The first coat of aluminum epoxy mastic shall be spray-applied to the recommended dry film thickness and allowed to cure for 18 to 24 hours at 72 ± 2 °F (22 ± 1 °C) and 50 ± 5 percent relative humidity. The second coat of epoxy shall be spray applied and allowed to dry for a minimum of 7 days prior to testing. Prior to exposure, test panels shall be scribed in accordance with ASTM D1654 such that the coating is uniformly removed down to the substrate along the entire length of the scribe.

Cyclic Test Exposure

Six test coupons of the aluminum epoxy coating system shall be exposed in accordance with ASTM G 85, Annex A5, and ASTM G 53 with the following modifications and conditions. The concentration of the dilute salt solution shall be 0.4 percent ammonium sulfate and 0.05 percent sodium chloride. The salt spray temperature shall be 30 °C and the dry-off temperature 40 °C. The UV-condensing cabinet shall use UV-A bulbs and be run at 60 °C during the 4h UV cycle and at 50 °C during the 4h condensation cycle. Samples shall be exposed alternately for 1 week in the G 53 cabinet followed by 1 week in the G 85 cabinet for a total of 4032h.

Inspection and Evaluation of Test Coupons

The coatings shall be evaluated for rusting, blistering, and rust undercutting at the scribe in accordance with ASTM D610, SSPC-Vis. 2, ASTM D714, and ASTM D1654. A transparent grid overlay shall be used to enhance the results of the visual examination. Panels shall be evaluated after 332, 672, 1344, 2016, 2688, 3360, and 4032 hours of exposure, except that undercutting at the scribe shall only be determined after 4032 hours.

⁷ The VOC content of the mixed, ready-to-apply material shall be determined in accordance with USEPA method 24.

Quality Assurance

Responsibility

Unless otherwise specified, the contractor is responsible for the performance of all inspection requirements specified herein. The Government reserves the right to perform any of the inspections set forth when deemed necessary to assure that the material conforms to the prescribed requirements.

Inspection

Sampling shall be in accordance with ASTM D 3925. Testing shall be conducted in a Government-approved testing facility using the manufacturer's designated dry film thickness applied in the recommended number of coats. Generally this system will be applied in two coats with a total dry film thickness of 8 to 14 mils. Failure to meet any requirement specified herein shall be cause for rejection.

- 1. First article inspection when specified shall include all tests of salient characteristics, and may be standard production material from the supplier's current inventory.
- Quality conformance inspection shall include all of the requirements specified herein with the exception of the provisions for accelerated corrosion resistance and volatile organics unless otherwise specified.
- 3. Coatings shall be subject to inspection for requalification purposes every 3 years, or at which time that the product is reformulated. The requirements shall be the same as for first article inspection.

Certification

The contractor shall certify, and maintain substantiating evidence, that the products conform to the producer's own specifications, standards, and quality assurance practices. The Government reserves the right to require proof of such conformance prior to first delivery and thereafter as may be otherwise provided for by the contract.

Packaging

Materials shall be packaged and marked as specified in ASTM D 3951. The manufacturer of the material shall provide material safety data sheets and instructions for application of the product.

Further Notes

Note 1

This coating system is primarily for use on hand- or power tool-cleaned exterior steel substrates in normal or industrial atmospheres. It may also be used for interior areas that are dry or subject to high humidity and condensation. In some cases this system may be used to overcoat existing coating systems as a means of extending their service life. An assessment of the current coating condition and the application of a test patch of the proposed overcoat material must be conducted before scheduling the painting contract. Higher grades of surface preparation, such as commercial blast cleaning, may be selected at the discretion of the specifier. Commercial blast cleaning may be appropriate for complete removal of a heavily deteriorated coating system. Grades of surface preparation higher than SP-6 will not significantly improve the performance of the coating system and do not warrant the added expense.

Note 2

At least 6 months should be allowed for the qualification of any manufacturers brand of aluminum epoxy mastic paint. Because of the long time necessary to qualify coatings, the purchaser should consider selecting a previously qualified coating.

Suggested Sources

| Source | Product |
|---|--------------------------|
| Carboline 350 Hanley Industrial Court St. Louis, MO 63144 | Carbomastic 15LO |
| Carboline 350 Hanley Industrial Court St. Louis, MO 63144 | Carbomastic 90 Aluminum |
| Devoe Coatings Company 4000 DuPont Circle Louisville, KY 40207 | Bar Rust 239 |
| Sherwin-Williams 101 Prospect Ave., NW Cleveland, OH 44115-1075 | Epoxy Mastic Aluminum II |

Appendix D: Commercial Item Description of a Coating System for Minimally Prepared Atmospheric Steel-Epoxy Primer/Urethane Topcoat

Abstract

This paint system consists of a commercially available epoxy mastic primer and urethane topcoat produced by a single manufacturer and marketed for use as a system. The coating system is suitable for use on minimally prepared rusted and/or painted ferrous metal substrates. Wide latitude is afforded the formulator, provided the system meets the requirements as specified herein. The coatings shall not contain lead, chromium, cadmium, or chlorinated solvents. As a minimum, the topcoat shall be available in white, black, grey, and safety yellow. Qualification testing shall be performed on systems using the white topcoat.

Salient Characteristics

The coating system shall comply with the following requirements when tested.

Application Properties¹

The primer and topcoat shall not sag, run, or streak when tested as specified.

Appearance of the Dried Paint Film 2

When tested as specified the primer shall have no visible cracks.

The primer and topcoat shall be applied by brush, roller, and conventional and airless spray at the manufacturer's recommended thicknesses.

The dried coatings shall have a smooth uniform appearance. A dried film of the epoxy primer shall exhibit no cracks or fractures when examined under 30X magnification.

D2 USACERL TR 96/01

Dry Time3

The primer shall dry-hard in less than 8 hours and the topcoat in less than 6 hours.

Pot Life4

The viscosities of the mixed primer and mixed topcoat shall not increase by more than 10 Krebs units (KU) over a 4-hr period.

Intercoat Adhesion5

When tested as specified, the topcoat shall show no intercoat delamination from the primer.

Volatile Organics⁶

The volatile organics content of the ready to apply primer and topcoat shall not be greater than 350 g/L and 420 g/L respectively.

Cyclic Corrosion Test⁷

No more than two panels shall exhibit blistering adjacent to the scribe after 1344 and 2016 hours of testing. No more than four panels shall exhibit blistering adjacent to the scribe after 2688 and 3360 hours of testing. The average of the sum of the final numerical blister ratings shall not be less than 8.0. The blister rating shall be the average of the sum of the average numerical ratings for frequency and size. Frequency ratings shall be converted as follows: 10 = none, 8 = few, 6 = medium, 4 = medium dense, 2 = dense, 0 = total. Blistering not immediately adjacent to the scribe shall be cause for rejection. The final rust rating for each of the six test panels shall be 10. No single test panel shall have a rust undercut rating of less than 5.0 and the average

The time to dry-hard shall be determined for the primer and topcoat applied at the recommended film thicknesses in accordance with ASTM D 1640-83 (Reapproved 1989).

The viscosity of 1-qt samples of epoxy primer and urethane topcoat shall be determined immediately after mixing and 4 hours later in accordance with ASTM D 562-82 (Reapproved 1990).

The primer/topcoat system shall be spray applied to the recommended film thickness. The primer shall be air dried for 72 hours at 72 ± 2 °F (22 ± 1 °C) and 50 ± 5 percent relative humidity prior to application of the topcoat. The topcoat shall be allowed to dry 7 days prior to testing. A sharp knife shall be used to produce two parallel scribes through the coating approximately 1 in. long and 1/4-in. apart. A third scribe shall be made perpendicular to and through the parallel scribes. The knife shall be used to determine the intercoat adhesion by attempting to delaminate the urethane topcoat from the epoxy primer along the perpendicular scribe.

The volatile organic content of the primer and topcoat shall be determined in accordance with the requirements of USEPA Method 24.

The corrosion resistance of the epoxy/urethane coating system shall be evaluated using this test procedure.

scribe rating for the six test panels shall not be less than 7.0. The sum of the average blister, rust, and undercut ratings shall not be less than 25.0.

Preparation of Test Specimens

Prerusted test specimens measuring 3.0 x 9.0 x 0.125 in. shall be prepared in accordance with SSPC Coatings Test Panel Preparation Specification No. 1, *Uncontaminated Rusted Steel* (SSPC Draft Specification No. 2, January 1995).

Application of Paint System

The primer shall be spray-applied to the recommended dry film thickness and allowed to cure for 18 to 24 hours at 72 ± 2 °F (22 ± 1 °C) and 50 ± 5 percent relative humidity. The topcoat shall be spray applied and allowed to dry for a minimum of 7 days prior to testing. Prior to exposure test panels shall be scribed in accordance with ASTM D 1654 such that the coating is uniformly removed down to the substrate along the entire length of the scribe.

Cyclic Test Exposure

Six test coupons of the epoxy/urethane coating system shall be exposed in accordance with ASTM G 85, Annex A5, and ASTM G 53 with the following modifications and conditions. The concentration of the dilute salt solution shall be 0.4 percent ammonium sulfate and 0.05 percent sodium chloride. The salt spray temperature shall be 30 °C and the dry-off temperature 40 °C. The UV-condensing cabinet shall use UV-A bulbs and be run at 60 °C during the 4h UV cycle and at 50 °C during the 4h condensation cycle. Samples shall be exposed alternately for 1 week in the G 53 cabinet followed by 1 week in the G 85 cabinet for a total of 3360h.

Inspection and Evaluation of Test Coupons

The exposed test coupons shall be evaluated for rusting, blistering, and rust undercutting at the scribe in accordance with ASTM D 610, SSPC Vis. 2, ASTM D 714, and ASTM D 1654 after 1344, 2016, 2688, and 3360 hours of exposure except that rust undercutting at the scribe shall only be rated at the completion of testing.

Quality Assurance

Responsibility

Unless otherwise specified, the contractor is responsible for the performance of all inspection requirements specified herein. The Government reserves the right to perform any of the inspections set forth when deemed necessary to assure that the material conforms to the prescribed requirements.

Inspection

Sampling shall be in accordance with ASTM D 3925. Testing shall be conducted in a Government-approved testing facility using the manufacturer's designated dry film thickness applied in the recommended number of coats. Generally this system will be applied in two coats with a total dry film thickness of 8 to 14 mils. Failure to meet any requirement specified herein shall be cause for rejection.

- First article inspection when specified shall include all tests of salient characteristics, and may be standard production material from the supplier's current inventory.
- 2. Quality conformance inspection shall include all of the requirements specified herein with the exception of the provisions for accelerated corrosion resistance and volatile organics unless otherwise specified.
- 3. Coatings shall be subject to inspection for requalification purposes every 3 years, or at which time that the product is reformulated. The requirements shall be the same as for first article inspection.

Certification

The contractor shall certify, and maintain substantiating evidence, that the products conform to the producer's own specifications, standards, and quality assurance practices. The Government reserves the right to require proof of such conformance prior to first delivery and thereafter as may be otherwise provided for by the contract.

Packaging

Materials shall be packaged and marked as specified in ASTM D 3951. The manufacturer of the material shall provide material safety data sheets and instructions for application of the product.

Further Notes

Note 1

This coating system is intended primarily for use on hand- or power tool-cleaned exterior steel substrates exposed to rural or industrial atmospheres where finish colors other than aluminum are desired. It may also be used for interior surfaces that are dry or subject to high humidity and condensation. In some cases this coating system can be used to overcoat existing coating systems as a means of extending their service life. An assessment of the current coating condition and the application of a test patch of the proposed overcoat material must be conducted to determine the viability of the overcoat option. Higher grades of surface preparation, such as SSPC-SP 6, Commercial Blast Cleaning, may be selected at the discretion of the specifier. SP 6 may be appropriate for the complete removal of a deteriorated coating system. Better grades of surface cleaning than SP 6 will not significantly improve the performance of the coating system and do not warrant the higher cost.

Note 2

At least 6 months should be allowed for the qualification of any manufacturers system. Because of the long time period required for qualification, the Contractor should consider selecting a previously qualified system.

Suggested Sources

| Source | Product |
|---|--|
| Carboline 350 Hanley Industrial Court St. Louis, MO 63144 | Primer: Carbomastic 90 Topcoat: Carbothane 134HS |
| Carboline 350 Hanley Industrial Court St. Louis, MO 63144 | Primer: Carbomastic 15LO Topcoat: Carbothane 134HS |
| International /Courtalds Coatings 6001 Antoine Houston, TX 77210-4806 | Primer: Intergard H.S. Universal Epoxy Topcoat: Interthane |
| Sherwin-Williams 101 Prospect Ave, NW Cleveland, OH 44115-1075 | Primer: Surface-Tolerant Epoxy Topcoat: Hi Solids Polyurethane |

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